DOCUMENT RESUME

ED 465 366 HE 035 018

TITLE	Teaching and Learning Infrastructure in Higher Education. Report to the HEFCE by JM Consulting.
INSTITUTION	Higher Education Funding Council for England, Bristol.; Universities UK, London (England).; Standing Conference of Principals, London (England).
REPORT NO	HEFCE-2002/31
PUB DATE	2002-06-00
NOTE	68p.
AVAILABLE FROM	Higher Education Funding Council for England, Northavon House, Coldharbour Lane, Bristol, England BS16 1QD, United Kingdom. Tel: 0117-931-7317; Fax: 0117-931-7203; Web site: http://www.hefce.ac.uk.
PUB TYPE	Information Analyses (070)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Educational Facilities; *Educational Planning; *Financial Support; Foreign Countries; Government Role; *Higher Education; Learning; *Resource Allocation; Teaching (Occupation)
IDENTIFIERS	*England; *Infrastructure

ABSTRACT

This report reviews the requirements for infrastructure for teaching and learning in United Kingdom universities and colleges of higher education. It assesses the extent of remedial investment required, using data from many sources, and sets out the conditions needed to manage this infrastructure on a sustainable basis. The report is primarily concerned with current needs (2001-2006) but also looks at current trends and developments and their implications for the infrastructure required to support them. Parallel reports are being developed for the infrastructure required to support research. To a large degree, the study is concerned with the generic institutional infrastructure that underpins all university academic activity (buildings and services). The report emphasizes three recommendations: (1) a policy initiative to clarify and support the responsibility of institutions for planning and investing to maintain their own physical infrastructure on a sustainable basis; (2) a capital funding scheme provided by the government to allocate resources to institutions on a formulaic basis spread over several years to address the five billion pound remedial investment needed for existing infrastructure; and (3) a project-based scheme to which institutions could bid for advanced facilities to increase capability for e-learning and widening participation. An appendix lists terms of reference and the individuals and organizations consulted for this report. A glossary is attached. (SLD)

Reproductions supplied by EDRS are the best that can be made
from the original document.

June 2002/31

ED 465 366

June 2002/31

Issues paper

This report is for information only

This is a review of the requirements for infrastructure for teaching and learning in UK universities and colleges of higher education. It assesses the extent of remedial investment required, and sets out the conditions needed to manage this infrastructure on a sustainable basis. The report is primarily concerned with current needs, but looks at trends and developments and their implications for the infrastructure required to support them. It makes recommendations that need to be considered in the context of ones made in the related reports for research infrastructure.

Teaching and learning infrastructure in higher education

Report to the HEFCE by JM Consulting

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE, AND IN ELECTRONIC MEDIA FOR ERIC COLLECTION SUBSCRIBERS ONLY, HAS BEEN GRANTED BY

R. Kiver

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2A

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Universities UK

SCOP promoting higher education colleges

BEST COPY AVAILABLE

HIGHER EDUCATION hefce FUNDING COUNCIL FOR ENGLAND

HE 035 018

Contents

		page
Executive summary and recommendations		3
1 Introduction		
	1.1 Terms of reference	12
	1.2 The science report	12
	1.3 Study method	12
	1.4 Scope, definitions and terminology	13
	1.5 The report	13
2 Development of teaching and learning and its implications for infrastructure		
	2.1 Introduction	14
	2.2 The size of the student population	16
	2.3 Types of student and implications for infrastructure	18
	2.4 The HE sector	22
	2.5 The funding of teaching	24
	2.6 Pedagogy (contact time, group sizes etc)	25
	2.7 Structure of the curriculum and the academic year	28
	2.8 Libraries and learning resources	30
	2.9 Information and communications technology	32
	2.10 Other support to teaching and learning	36
	2.11 Space utilisation	37
	2.12 Conclusion: teaching, learning and infrastructure	40
3 The teaching infrastructure		
	3.1 Introduction	42
	3.2 The value, financing, and condition of the estate	42
	3.3 Capital funding of HE infrastructure	42
	3.4 Management of assets and infrastructure	44
	3.5 Categories of investment need	45
	3.6 Requirements: generic institutional infrastructure	46
	3.7 Requirements: the well-found teaching environment	53
	3.8 Requirements: advanced infrastructure	58
	3.9 In summary	59
Appendix A Terms of reference, and list of individuals and organisations consulted		61
Glossary of terms		63

Executive summary and recommendations

Introduction

1. This report reviews the requirements for infrastructure for teaching and learning in UK universities and colleges of higher education. It assesses the extent of remedial investment required, and sets out the conditions needed to manage this infrastructure on a sustainable basis. The report is primarily concerned with current needs (2001-06), but also looks at current trends and developments and their likely implications for the infrastructure required to support them.

2. These requirements for teaching and learning are part of a broader picture. It is a feature of UK higher education that teaching and research are conducted in the same institutions, often using some shared accommodation and facilities, and their infrastructure requirements are therefore closely inter-related. Therefore parallel reports on the infrastructure needs of research have been published.

Teaching and learning in UK higher education

3. Across the HE sector, teaching is the main activity. Approximately 60% of academic staff time and 70% of the space of institutions are attributable to teaching. Student numbers have grown in recent years while student:staff ratios have increased. Total space has not grown as much as student numbers. Funding per student has also decreased. These trends could be said to reflect increasing efficiency, but they have put pressure on staff and infrastructure.

4. Teaching is the core business for every higher education institution (HEI), one that all institutions need to do well. There is evidence that HE teaching in the UK is generally of a high quality and cost-effective compared with international competitors. Completion and drop-out rates, for example, compare very favourably with HEIs overseas.

5. Teaching in higher education has important social and economic benefits. As well as providing a well-qualified workforce to contribute to the modern high technology and knowledge-based economy, it provides a national base of scholarship and learning which attracts overseas students and academics, positions UK institutions to compete internationally, and provides the environment within which most UK research is based, and from which the researchers of the future are derived. There are therefore powerful economic reasons for ensuring that teaching has the investment and infrastructure it needs, as well as broader social and cultural benefits.

6. The Government's objective of increasing, and widening, participation in higher education builds upon trends that are already well established in higher education, but has particular significance in terms of the infrastructure needs of the sector.

Developments in teaching and learning

7. Teaching in higher education is facing a period of change. Factors driving changes include:

   - the past and projected growth in student numbers and in the diversity and breadth of the student population;
   - the rise of new subjects, e.g., the non-medical health professions, media, and creative arts, which have brought new cultures and approaches to higher education;
   - developing regimes of quality assurance, and the quest for quality enhancement;
   - changes in schools and in the expectations and abilities of students entering higher education;
   - information and communications technology (ICT);
   - increasing interest and demands by employers, the professions and other stakeholders about the qualities and characteristics they expect of graduates.

8. In addition to such environmental factors, the sector is developing new approaches to the way that teaching and learning are conducted. The range of pedagogic methods used in higher education includes lectures; tutorials; seminars; laboratory and workshop practice; field work; projects; clinical and industrial placements; simulations; self-directed learning; e-learning; distance learning. The blend of these methods experienced by students in any particular course or module varies by discipline, by year, level and type of student, and according to the interest, expertise, and policies of academics and institutions.

9. This diversity of pedagogic methods, and the autonomy of institutions and academics to develop them, is a feature of UK higher education, and is seen as a strength. We have not been able to find any over-arching strategy to drive developments in teaching and learning, or even a national consensus about 'what the future should look like' for any particular aspect of teaching (although many individuals whom we have consulted have views about this). This poses a particular challenge for this study, as it means there is no 'standard specification' that we can use to define infrastructure needs. Similar difficulties apply to costing teaching.

10. This could be contrasted with the situation in research, where the Research Assessment Exercise (RAE) and international pressures have generated some convergence towards a 'business model' for research, and this makes it easier to assess infrastructure needs.

11. Given this background, a pragmatic and empirical approach has been adopted to establish infrastructure needs, which included two strands of work:

    a. extensive discussions of potential developments in teaching and learning with a number of 'experts' and 'advisers' who were selected because of their personal interest in, and experience of, current thinking and developments in teaching and learning;

b. institutional case studies were conducted, considering infrastructure use and requirements for teaching and learning, now and in the immediate future.

12. Assumptions about the future that were used in assessing requirements for infrastructure to 2006 are as follows:

    a. student numbers will rise – and much of this growth will be in so-called non-traditional categories of students whose needs are different from those of the major part of the student population in the past (i.e. well-qualified, full-time, school leavers);

    b. further improvements in efficiency and space utilisation will limit the increase in staff numbers and space required (although there will be growth in certain areas, and at the margins overall);

    c. developments in teaching and learning methods and technologies, including the use of ICT and the proportion of off-campus learning, will continue, but will not lead (in this period) to a wholly new requirement for infrastructure to support teaching;

    d. there may be changes in the number and nature of institutions, or the structure and funding of teaching, but these will not radically change the requirements for infrastructure. However, to be successful, institutions need to become more flexible in their use of staff and infrastructure, in order to respond to more diverse needs within a limited funding profile.

13. These may appear conservative assumptions to those who are enthusiastic proponents of new developments in teaching and learning. However, we believe they are realistic bearing in mind that:

    - few institutions (or disciplines) currently have a strategy which could drive more radical or rapid developments centrally;
    - such developments would be significantly dependent on changes affecting staff and working methods, which would take time;
    - any major impact on infrastructure requirements therefore lie outside the timescale of this study.

The environment for teaching and learning

14. To a large degree, this study is concerned with the generic institutional infrastructure which underpins all university academic activity (i.e. buildings, services, IT networks, libraries). This physical infrastructure in higher education institutions supporting teaching and research is made up of buildings with an insured value of approximately £26 billion, plus equipment and contents of a further £8 billion.

15. The infrastructure for teaching also includes some specific equipment and facilities (increasingly IT-driven), and some staff and services.

16. A number of factors have combined to create a situation where the physical assets of universities and colleges have generally been undervalued, and

under-invested, relative to good long-term asset management practice in a commercial business. The principal influences have included:

- the past public-funded culture of higher education;
- the significant numbers of 1960s and 1970s buildings, which are already unsuitable in many cases, and near the end of their design life;
- capital funding of universities has tended to address specific projects and to reward institutions with poor infrastructure, which has not encouraged self-help and whole-life asset management;
- recurrent funding of research below full economic costs has put pressure on all infrastructure, including that for teaching;
- the long-term decline in the unit of resource for teaching;
- issues about the strategic management of estates, particularly in the more traditional research universities which have been led by academic officers, and which have not given priority to long-term estates strategy or to commercial property and investment skills;
- the absence of properly integrated teaching and learning and resource strategies in institutions.

17. Institutions have had varying degrees of success in managing these pressures. A small proportion of those visited during this study claimed to have relatively little problem of 'under-investment' in their infrastructure. However, these were exceptional, and perverse incentives in the funding mean that many HEIs which have practised such self-help perceive that they have made themselves less eligible for future capital funding schemes, and so may become less sustainable as a result.

18. The factors above apply equally to research and teaching. However, teaching infrastructure has probably suffered relatively more because of the competition for resources from research, which has been driven by factors including the RAE, external grant and project funding, and health and safety requirements. Many case study institutions have had to find matching funds for JIF and SRIF projects in the sciences, and this has had an adverse effect on the levels of investment that would otherwise have been made in teaching and in the arts and humanities.

19. There have been capital funding schemes available for teaching, but relatively less than for research. Chapter 3 shows that out of approximately £4 billion in capital funds allocated to institutions over the past 10-12 years, a maximum of approximately 35% was in principle accessible for teaching (compared with its 60% share of infrastructure costs).

20. This public investment in teaching infrastructure has some significant achievements to its credit, such as:

- the significant number of new learning resources centres in the sector, plus a few flagship university libraries;
- the transformation of some poor former local authority estate into attractive modern HE-standard facilities;
- the relatively swift and effective introduction of ICT into the sector.

21. However, the picture is discipline- and institution-specific, and there remains a significant requirement for remedial investment across the whole higher education infrastructure for teaching.

Changes and challenges affecting infrastructure for teaching

22. As in research, the capital investment needs in infrastructure for teaching falls broadly into three categories:

- generic institutional infrastructure: i.e. suitable space for teaching, appropriately serviced and including the main institutional learning resources (IT and libraries);
- specialist teaching and discipline-related equipment;
- advanced facilities to keep UK work at the leading edge in international competition.

Generic institutional infrastructure

23. This category is the most important for teaching and most of the issues relate to this. They include:

a. **building condition:** much of the stock of buildings and plant is in an unsatisfactory maintenance condition (i.e. with backlogs). A high proportion of the teaching infrastructure was built in the 1960s and 1970s and is now nearing the end of its design life, and much is in a very poor condition. There are also issues about new requirements for health and safety and disabled access;

b. **suitability of space for modern teaching needs:** there is no standard specification for modern teaching accommodation, but much of the space available is poorly configured. Common problems include: lack of space; small or scattered rooms; rooms with inadequate capacity for IT and other services; furniture which is inflexible, or inappropriate to a modern attractive environment; absence of suitable staff rooms, learning spaces, and social spaces; student facilities which are inappropriate to new types of student; buildings which are poorly located in relation to other requirements;

c. **utilisation of space and assets:** overall, utilisation of teaching space is poor. This is partly a result of problems of condition and suitability, and of inflexible estate (e.g. lecture rooms scattered across departments, rather than centrally managed). It is not helped by the culture in parts of the sector where teaching is largely confined to certain peak periods in the week and the year. This model is less appropriate with a more diverse student population, and is changing. Many could use their space much better if funds were available for restructuring and refurbishment;

d. **ability to attract students and staff:** in teaching, as in research, institutions are frequently competing in an international market for both students and staff. It is important that UK institutions are not perceived

to be 'a poor relation' in terms of space and facilities, or they will lose out in ways that will directly or indirectly damage the UK economy;

e. **key skills and employability:** in many disciplines students are less employable, and will make less valuable contributions to the UK economy, if they have been educated using out-dated equipment, technology, facilities, software etc. Employers expect a higher education to provide 'state of the art' skills, but many HEIs cannot afford the most modern equipment and facilities. In some cases, schools offer better facilities;

f. **Widening participation, lifelong learning, and related social agendas:** this is really an extension of point d. The extension of participation in higher education requires facilities which cannot merely cope with a larger and more diverse student body, but which will be relevant and attractive to a much wider range of students, including for example: adults; those in full-time employment; those who will not be motivated by facilities which are aimed at academic school leavers (for whom most of the current infrastructure was designed);

g. **libraries:** information and learning resources, with adequate space and access to use them, are vital to student learning. There have been significant pressures on library budgets in recent years due to growth in student numbers and in materials required. ICT and electronic journals have added to, not reduced, library costs, and the role of libraries is changing as they are required to support a much broader range of student learning experiences;

h. **information and communications technology**: this offers enormous potential to improve student learning, but the pace of technology change and the widespread availability, including in schools, raises expectations which HEIs cannot afford to neglect. Like any modern information-based business, HEIs need to budget for continuous replacement and up-grading of their ICT.

24. The findings of this study, based on detailed assessments at 12 case study institutions, lead to the conclusion that the sum required for remedial investment in generic institutional infrastructure to deal with the issues above is approximately £8 billion, of which 60% or £4.6 billion is specific to the needs of teaching and learning.

25. The need for remedial investment clearly varies between institutions but it would be complex to differentiate, and to fund only those with the greatest apparent need would discourage self-help and a long-term strategic approach to infrastructure. Funding should therefore be made available to all institutions on a formula basis. As with our recommendations on infrastructure for research, it could be made conditional on institutions producing a medium-term strategy for the management of their generic infrastructure. It should cover buildings and associated services and facilities, including library buildings and IT networks, but not include staffing or the purchase of library material.

Well-found laboratory or equivalent

26. This requirement relates to specific equipment and environments for teaching in addition to space and services provided as part of the generic institutional infrastructure. It includes specialist equipment and facilities: e.g. for laboratory, workshop, studio, clinical teaching in those disciplines which are not 'classroom based'.

27. Under this heading is a specific requirement to equip the main institutional teaching rooms with modern ICT and learning aids to an appropriate specification which would, for example, include data projectors in all large lecture rooms, CCTV in overflow lecture rooms.

28. The remedial requirement here is £500 million, made up of £400 million for the 'non-classroom' facilities plus £100 million for the teaching room equipment.

Advanced or specialist facilities

29. The levels of remedial investment discussed above would enable all UK institutions to bring their infrastructure for teaching to a state where it poses no significant constraints on their ability to deliver their current teaching objectives, with no further back-logs to be rectified. As in research, there is an additional need for some investment in infrastructure projects at a national level to enable the developments in teaching and learning which are required to keep UK institutions abreast of the latest and most effective methods.

30. The chief area for infrastructure projects is distance e-learning and the requirements of widening participation. This category of infrastructure investment supports facilities which would not be expected or required in every institution, but in a few national centres which are at the forefront of these developments. This investment, like JIF in the sciences, is therefore partly remedial but also partly developmental.

31. There is no ready method to provide an objective estimate of the scale of need here. However, a suitable level of funding might be of the order of £100 million, spread over a period of several years and available to institutions on a bidding basis, where they could demonstrate a suitable return on this investment. We have recommended a broadly comparable scheme for strategic investment in infrastructure for research.

Recurrent investment needs

32. As well as these capital requirements, institutions need to spend on a recurrent basis to support teaching and academic staff. This would include funds for technicians and other support staff; minor equipment; travel; journals and books; and conferences. These funds have been squeezed by the recent years of efficiency gains in higher education. There are many examples of case study institutions suffering reduced productivity as a result. The shortfalls in this area vary greatly and therefore a general figure for the

whole sector has not been calculated. However, institutions need to budget to remedy these gaps.

33. More generally, the sector needs to be funded, and to manage its infrastructure on a basis that is sustainable into the future and will not lead to a recurrence of this level of deficit in capital investment. Over the long term, institutions should be investing approximately 4% of their insured asset value on an annual basis to allow for necessary renewal and replacement of buildings and equipment. They need to plan to spend over 5% to take into account cost inflation. Institutions are currently spending just over 50% of this required level.

34. Finally, investment in infrastructure for teaching will only deliver the benefits expected if there is also adequate investment in staff and staff development to enable them to engage in scholarly activity, to develop and improve their teaching methods, and to adapt to, and make full use of, the developments in ICT which can improve teaching and learning in higher education.

Benefits from this investment

35. It is necessary good stewardship of national resources to manage and maintain the infrastructure for teaching and learning in a condition where it can make a full contribution to the Government's aims for higher education.

36. Much more positively, the UK's leading position in the worlds of business, culture, diplomacy and research are all underpinned by the performance and reputation of our universities and colleges as centres for scholarship and teaching. Enabling universities and colleges to realise the full potential of their teaching and learning can make a major contribution to exports, to employment, to the development of UK-based industries and professions, and to the broader economic and social objectives of the Government.

Recommendations: towards a sustainable infrastructure

37. These recommendations need to be considered in the context of those made for the research infrastructure. They are intended to provide the conditions for achieving the benefits discussed above and maintaining the infrastructure on a sustainable basis in future, so that further emergency remedial programmes should not be required.

    Recommendation 1. A policy initiative, by Government and the funding councils, is needed to clarify and support the responsibility of institutions for planning and investing to maintain their own physical infrastructure on a sustainable basis.

38. As part of this, institutions should be required to assess their own infrastructure needs, and to prepare an asset management strategy, including a five-year plan for remedial investment in generic and teaching infrastructure, clearly linked to their estates and teaching and learning strategies. Submission of such a strategy should be made a condition of the

remedial capital funding in Recommendation 2, but we would not wish funding councils to interpret this as requiring detailed scrutiny of institutions' plans which would create extra work for both institutions and the funding councils.

Recommendation 2. The Government should provide a capital funding scheme, allocated to institutions on a formulaic basis and spread over several years to address the £5 billion (2001 prices) remedial investment in existing infrastructure (generic plus well found laboratory or equivalent) identified above.

39. The funding should be allocated by formula using an appropriate method which reflects teaching and learning requirements. Unlike project-based schemes such as HEFCE poor estates, institutions should not be required to provide directly matching funds, as the effect of this would be to inhibit or delay the necessary remedial investment.

40. Value for money for this funding would be achieved by the requirement for a holistic institutional strategy for infrastructure linked to academic strategies, and a major aim of this recommendation is to remove the need for future retrospective and remedial public funding schemes, which are generally not a cost-effective way to maintain the HE asset base.

41. This change of approach to funding on a longer-term and more planned basis will enable institutions to target priorities and they will therefore be motivated to stretch the money available, and to draw in contributions from other sources to maximise the benefits of the public investment.

Recommendation 3. To address the evolving needs of UK capability in e-learning and widening participation, a more selective project-based scheme is needed to which institutions could bid for a limited number of advanced facilities perhaps at a level of £100 million over a five-year period.

42. This is a different purpose from sector-wide remedial investment, and the scheme could appropriately be designed on a different basis. The funds could be released in response to proposals submitted by institutions, but such bids could sensibly be reviewed in the light of the five-year strategies being developed by institutions under Recommendation 1.

1 Introduction

1.1 Terms of reference

1.1.1 The purpose of this study was to review the higher education infrastructure for teaching and in particular:

- to review the adequacy of university and college infrastructure to support teaching and learning;
- to define and measure the size of any investment gap in this infrastructure;
- to identify the factors which contribute to institutions' investment decisions in these areas and their relative importance;
- to draw out policy recommendations for the future.

1.2 The science report

1.2.1 The study was commissioned by the HEFCE in collaboration with Universities UK and the Standing Conference of Principals (SCOP) in June 2001. It was carried out in parallel with a study of the infrastructure for research which is covered in two separate reports, one for science published by the Office of Science and Technology (referred to throughout this document as 'the science report'), and one for the arts and humanities to be published by the HEFCE.

1.2.2 The science report was published in March 2002, titled Study of science research infrastructure. It can be viewed on the Office of Science and Technology website www.ost.gov.uk. This covers generic institutional infrastructure as well as infrastructure specific to science research. It therefore contains a significant amount of evidence and analysis which is of direct relevance to teaching and which is not replicated in this report.

1.3 Study method

1.3.1 The work for this study included research and discussions with a range of individuals and groups. In-depth discussions were held with 23 UK institutions in the course of reviews on infrastructure needs; 18 of these were visited. Some case studies were chosen primarily for the science research study, others were selected specifically to contribute to analysis of the teaching infrastructure. Teaching was covered in most of these institutions.

1.3.2 In addition to institutional meetings, a group of individuals was consulted during the study, chosen for their interest in, and knowledge of, current developments in teaching and learning. This group assisted at a workshop in November 2001, and commented on a draft of this report. Its members are listed at Appendix A. More formally, the work was guided by an advisory group, also listed in Appendix A.

1.4 Scope, definitions, and terminology

1.4.1 For this review, teaching infrastructure is defined as including the following:

- buildings and plant;
- IT, libraries and related information resources;
- specific equipment and facilities for teaching;
- technical support staff and services.

1.4.2 It does not cover academic or administrative staff, student residences, or (most) off-campus activity.

1.4.3 This report is not about possible futures for teaching and learning. It is concerned with investment required in the current infrastructure and that immediately planned to meet current or already clearly identified needs. Given the timescales involved, this means it is necessary to be aware of developments in teaching and learning that are envisaged to be important over the next five years.

1.4.4 A glossary is included at the end of the report.

1.5 The report

1.5.1 This report should be read in conjunction with the science report. This report on the infrastructure for teaching and learning is a summary of the background and issues specific to infrastructure needs for teaching, and includes all the findings and recommendations. The science report provides more detailed background information, data and analysis on the generic university and college infrastructure which underpins both research and teaching. It therefore forms part of the evidence base for this report.

2 Development of teaching and learning and its implications for infrastructure

2.1 Introduction

2.1.1 In this chapter the nature of teaching of learning as it relates to infrastructure is discussed, and the assumptions made about how this might change over the next five years are outlined.

2.1.2 Teaching and learning in HE is a complex process. There are many models of teaching and learning, and a wide range of types of student, types of discipline, institutions and staff. These all impact in different ways on the infrastructure that is needed (and on the costs of teaching).

2.1.3 The sector appears to have devoted relatively little attention, in a managerial sense, to the evaluation of alternative approaches to teaching and learning. There are many groups and individuals who care about this, but there is no consensus within the sector which could drive a specification for infrastructure requirements. The approach in this study has therefore been a pragmatic one based on observation of what is currently in place, and the way it is changing.

2.1.4 The main external influences over the delivery of teaching in the past five to ten years include:

- growth in student numbers;
- access and a more diverse student population in terms of age, mode of study, previous educational experience, motivation and ability;
- the growth of information and communication technology (ICT), and mobile communications;
- parental, student and employer expectations;
- quality assurance processes;
- lifelong learning and broader changes in society;
- competition for overseas students and the rise of overseas education providers;
- e-learning (with many models in place).

2.1.5 The particular challenges now facing all institutions include:

- widening participation and associated expansion;
- lifelong learning;
- efficiency, and rationalisation of the sector.

The importance of infrastructure

2.1.6 The most important influence (and cost) in teaching and learning is academic staffing, and the way that academics operate. The students are probably the second most powerful influence. Infrastructure (buildings, libraries, ICT,

equipment), which is the focus of this study, is important (and a significant cost), but it is not the primary driver of the way that teaching and learning will develop. The strategic issues that emerge from this study therefore need to be considered within a broader context.

2.1.7 The most important aspect of infrastructure for teaching and learning is space, which includes:

- 'classrooms': contact teaching and learning space – seminar rooms, large and small lecture rooms, small rooms for tutorials;
- 'laboratories': practical work space – teaching laboratories, ICT suites, creative and performing arts facilities, workshops, research laboratories (farms and off-campus facilities are not covered in this report);
- 'learning space'; which ranges from directed learning spaces (group discussion rooms etc) to libraries, museums, social spaces, student residential accommodation;
- learning resources – libraries, ICT suites, collections etc;
- pastoral space – academic offices, small rooms;
- support space – students advisory services such as financial, accommodation, counselling, crèches;
- social space – students union, catering etc (also libraries, accommodation etc);
- students residences/accommodation (not covered in this review).

2.1.8 None of this space has a defined sole use. It is all important for teaching and learning, and is used in different ways for different disciplines, and by different institutions. To give an example, car parks and suitably 'adult' café facilities may be as essential for mature students to remain in HE and to learn as traditional classrooms and sports facilities are for school-leavers. The use of space is being reviewed by many institutions as they move towards student-centred learning, and cope with reductions in teaching funds per student. The key issue is: how large will the estate need to be, and how should it be configured?

2.1.9 The following off-campus facilities are not considered:

- placements (e.g. clinical, industrial);
- field trips (e.g. geography);
- performance (e.g. dance, exhibitions);
- hospitals (e.g. medical students).

2.1.10 However, an increase in off-campus activity is assumed, which will include the impact of:

- work-based learning;
- distance e-learning (including learndirect);
- collaborative provision, e.g. in FE (not covered in this study);
- overseas courses (not covered in this study).

2.1.11 E-learning is clearly providing an opportunity for change (although the cost is high and the pace of introduction slow). The issue in terms of infrastructure is, how much this will increase, either for the current student population, or for any new student types, and will specific local facilities off-campus be needed in future?

2.1.12 In respect of e-learning, it is necessary to distinguish between what is technologically possible, and what is a realistic assumption. Distance learning per se is not new, having been around for at least a century.

2.1.13 Definitions of the terms used in this study are in the Glossary.

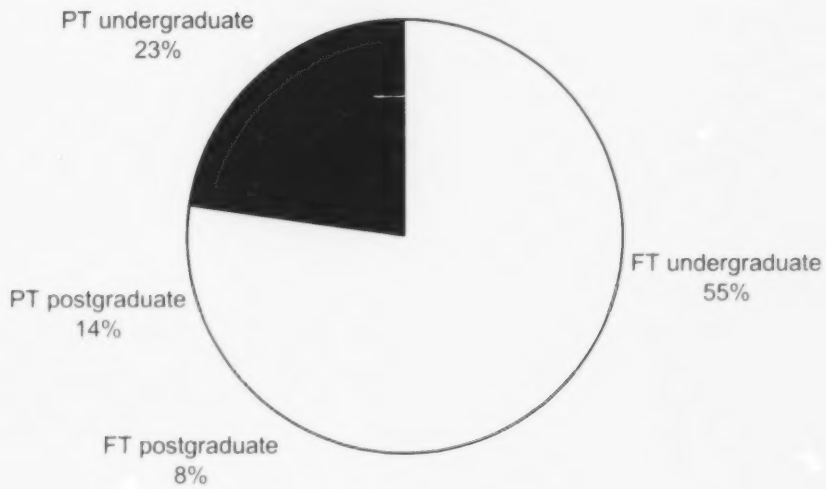
2.2 The size of the student population

The number of students in HE

2.2.1 There are nearly 2 million students learning in higher education institutions (HEIs).[1] As Figure 1 shows, the student population is predominantly:

- undergraduate – just over three-quarters of students are studying at undergraduate level (78%). Full-time, first-degree students make up almost half of the recorded HE student population (48.8%);
- full-time – two-thirds of all students study full-time or sandwich programmes (63.5%).

Figure 1 **HE students by level and mode**



[1] 1,918,970 students in HEIs, UK, 1999-2000. HESA. Of this total 62,640 (3%) are FE students; and 5.5% are research students. Student numbers quoted in this report, including Figure 1, are from HESA 1999-2000 statistics unless otherwise referenced.

2.2.2 The student population is also predominantly:

- aged 18-30 – 88% of first-year first-degree undergraduates are under 30; as well as 41% of first-year other undergraduates; and 49% of first-year postgraduates (all UK domiciled, and those whose age is known);
- domiciled in the EU/UK – 6.6% are overseas students.

2.2.3 However, significant proportions of the student population are mature and studying part-time. The part-time/full-time definition masks the current working practices of many full-time students who are holding jobs.

2.2.4 Expansion in higher education places over the last few years, combined with a renewed emphasis on widening participation to non-traditional students, has resulted in a diverse student profile. While most first degree, full-time undergraduate students are aged under 21, 30.5% of first-degree entrants are aged 21 or over.[2]

2.2.5 In addition, an increasing proportion of applicants, both full-time and part-time, are recruited from overseas, ethnic minorities and economically and socially disadvantaged backgrounds. For example, enrolment figures for ethnic minority students shows modest growth over the last five years to 13% of all UK domiciled entrants.[3]

Growth in HE

2.2.6 As reported in HEFCE 01/62,[4] the HE sector saw rapid growth in the early 1990s – student numbers in UK grew by 54% from 1998-99 to 1993-94. Since then growth has been steady, but at significantly lower levels – around 6% from 1996-97 to 2000-01. This growth was throughout the whole population, but the largest increase was in full-time undergraduate numbers. The main driver of this expansion was the increase in full-time participation of 18-30 year-olds, which rose from 15% of this age group in 1998-99 to 30% in 1993-94 as measured by the government age participation index (API).

2.2.7 The current government target is that 50% of 18-30 year-olds should have the opportunity to participate in HE by 2010. An HEFCE estimate of the potential additional student numbers is 300,000. However, some of these students will be in further education (FE) colleges and some may not take a full degree or diploma programme; the spread over the next eight years is not clear. A significant proportion may be non-traditional students from lower socio-economic groups.

2.2.8 Government forecasts suggest a 5% growth in overall higher education enrolments in the four years leading to 2003-04 in England.[5]

2.2.9 During this same period higher education institutions predict a 10% increase in full-time enrolments and a 13% increase in part-time enrolments.[6] A

---

[2] HESA press release PR25. 28 September 2001.
[3] First-year domiciled HE students by level of study, mode of study, gender and ethnicity: HESA Table 10a 1999-2000; and the similar HESA Table for 1994-95.
[4] HEFCE 01/62, Supply and demand in higher education, October 2001.
[5] DfES, November 2001.
[6] HEFCE 01/23: annual operating statements and financial forecasts 2001. Tables 7a and 7b.

significant part of the latter might be mature students on part-time courses and postgraduates.

2.2.10 However, whilst the government has funded an additional 16,000 higher education places in 2001-02[7] almost 9,500 degree places, predominantly in the new university sector, were left unfilled following the university clearing process in 2000-01.[8] It is likely that many higher education providers will not meet recruitment targets again in 2002-03.

2.2.11 With regard to overseas students, universities predict a 17% increase in full-time and nearly a 30% increase in part-time overseas student recruitment over the next five years.[9] However, UK HE has a quarter of the share of the international market that it had 10-15 years ago, and new types of provision from abroad are threatening UK markets.

2.2.12 Overall, it is difficult to forecast the increase in student populations over the period to 2010, but infrastructure needs should not be based on the most optimistic forecasts. In terms of the need for campus infrastructure, an effective increase of the order of 5% has been assumed.

2.3 Types of student and implications for infrastructure

2.3.1 A traditional model of on-campus, nine-to-five, provision still applies across most of the sector, for the majority of students (full- or part-time), in both research intensive and teaching intensive institutions (with some exceptions including the Open University). In most institutions there is some distance learning – but distance e-learning is a very small part of institutions' provision. Access institutions also make use of local facilities for delivery (e.g. learndirect centres, FE colleges) and work-based learning – mainly on the margins. However, in an increasing number of institutions there is an inexorable move to offer provision after 5pm and at weekends.

2.3.2 Two main drivers are changing this pattern: the growth of part-time and other modes of study, and the focus on widening participation – 'increasing access to learning and providing opportunities for success to a much wider cross-section of the population than now'.[10]

2.3.3 Both developments have meant a focus on student-centred learning; and on flexible modes of delivery and of learning. They are causing a transformation in the operation and use of higher education estates.

2.3.4 **Part-time students.** Between 1995 and 1999, the number of part-time students enrolled on some form of higher education programme more than doubled.[11] To meet the needs of these students, institutions with part-time provision have developed their estates strategies to ensure that:

---

[7] The Sunday Times, 'A-levels didn't make the grade? All is not lost.' 19.8.01

[8] The Sunday Times, 'No A-Levels needed for universities' 9.9.01

[9] HEFCE 01/23: Annual operating statements and financial forecasts 2001, tables 7l and 7b.

[10] Kennedy, 1997, p15.

[11] Times Higher Education Supplement website, based on HESA data on the breakdown between full- and part-time study in 1995-96 and 1999-2000, includes first-degree and other entrants.

- students have access to appropriate learning facilities (including studios and laboratories);
- the opening hours of libraries and learning resource centres support student needs (increasingly these are important for group work and peer-group learning);
- academic, academic support, pastoral and administrative staff are available when these students are present;
- student services such as computing centres, bookstores and cafes are open;
- safe and secure meeting spaces for groups of non-residential students are provided;
- access to leisure facilities is available; and
- students and staff have access to transportation facilities that meet the requirements of part-time students.

2.3.5 The enrolment of part-time students has also had an impact upon the allocation of classroom/laboratory/studio space to support the learning process. Specifically, institutions have had to develop and implement sophisticated approaches to timetabling rooms that not only match the requirements of part-time provision but also the individual needs of programmes of study. In some cases, due to constraints on available space (including room size) and economies of scale, this has led institutions to mix full- and part-time student populations.

2.3.6 The emergence of this new student profile has had a marked impact upon teaching strategies, including increased opportunities to undertake more flexible learning through part-time study, semesterisation, unitisation and modularisation, and distance learning opportunities.

2.3.7 **Distance learners.** Through the recent establishment of the e-University, the HEFCE is actively promoting this kind of learning on both a national and international basis. The e-University, a joint venture with the private sector, is the first UK-wide project to be developed for the express purpose of delivering higher education materials and courses through the internet.[12] These may be targeted in the early days at overseas markets, and mature students in the UK.

2.3.8 A report commissioned by the HEFCE and the Committee of Vice-Chancellors and Principals (now Universities UK) notes that distance (e-) learning curriculum is increasingly being developed to meet the needs of industry.[13] As a result, many students undertaking this form of study are likely to do so to upgrade skills and to enhance their professional standing rather than pursue a specific qualification or credits.

2.3.9 The report also notes that most distance learning curriculum is still primarily paper-based, and most programmes of study also still require some form of

[12] HEFCE press release 20.2.01; and HEFCE circular letter – e-university: incorporation of holding company, 12.7.01

[13] HEFCE and CVCP, the Business of Borderless Education: UK perspectives 'Summary report' March 2000 p15.

face-to-face teaching and support. However, this support may be offered through the workplace rather than institution-owned facilities.

2.3.10 Institutions need to assure themselves that their facilities are able to meet the requirements of distance learners and the academic staff that support their work. Estates planning must be developed and closely aligned to institutional ICT strategies. Facilities need to include high capacity computer networks that enable both remote and institution-based users to interact easily. These networks should allow reliable communication of information and materials between tutors, peers and, when necessary, administrators. They should also allow learners to access learning resources to facilitate the learning process, including discussion forums.

2.3.11 Estates strategies also need to take account of student groups meeting at different times for different lengths of time throughout the year. The Open University has successfully met this need by establishing learning centres that offer flexible space to meet the needs of off-campus learners. These centres can be booked by tutors to hold week-long seminars or weekly tutorials. In many cases, these centres are located outside the institutional estate so that students can meet in more accessible and convenient locations.

2.3.12 Needs therefore differ for each type of student. Potential implications on infrastructure from these emerging developments can be summarised in the following way.

2.3.13 Most **existing students** are actually part-time (most work) – they are taught significantly on-campus, but with increasing preference for weekends, evenings and summer, and with more e-learning (both on-campus and in institutional accommodation).

2.3.14 **New non-traditional or access students** will need to be attracted into HE provision. In terms of infrastructure this would mean two things:

a. The HE estate must be attractive to them. It needs to be welcoming – to reflect the youth culture, with well-laid out reception and social areas. It needs to reflect youth's technological awareness, and offer better facilities than their schools or home. To retain these students the HE estate needs to be well organised (easy to navigate); offering courses and an environment that 'captures the imagination'; with good 'social and leisure facilities'.[14]

b. For some students, geographically distant from the main HE campuses, and unable to travel (through domestic or other circumstances), local facilities could be provided. It is arguable that some of the widening participation target could be met through high-quality provision in local HE facilities. Learndirect is providing a possible role model in this. However, unless institutions 'piggyback' on existing infrastructure, the potential costs are enormous.

2.3.15 It is difficult to see distance e-learning providing the 'answer' to increased access. Students will need face to face support from lecturers, academics and other pastoral/support staff, and social and academic support from other

[14] Action on Access national conference at York 26.10.01

students. 'Access is not only about hardware and software; it is about creating an environment which attracts students by providing them with a place to meet their peers and teachers/tutors and with access to resources necessary to complete their courses'.[15] Distance e-learning will create demands for libraries and other learning resources, and for infrastructure to support the class group. Without this support, retention and progression rates will be poor.[16]

2.3.16 **Mature and lifelong learning students** are more likely to want to use the HE estate at weekends, in the evenings, or over the summer. This is the most obvious market for e-learning ventures; however, the costs of such provision are generally high and demand high numbers (or other cost-benefits) to be economically viable. Development costs are considerable. For example, the University of Phoenix uses a restricted curriculum largely confined to contemporary knowledge and therefore does not have the significant task of developing or accessing on-line resources to add to its development costs. Another venture, Ufl, has found that its costs are being affected by the need to acknowledge a maximum 'shelf-life' of 18 months for its industry programmes.[17]

2.3.17 **Overseas students** increasingly require good facilities. In an international market, (at least some) institutions in the UK need to be offering facilities that are on a par with leading institutions elsewhere. Some of the leading institutions in the USA are making significant investments in recognition of the need to recruit students from overseas. Competition from overseas providers will only increase.

2.3.18 The need to address the requirements of **disabled students** is now enshrined in legislation and a Quality Assurance Agency for Higher Education (QAA) code of practice. These need to be considered in strategies for learning and teaching. Access to accommodation is only one aspect of this, but it is the only one that was quantified in this study (see chapter 3).

2.3.19 The trends outlined in this section can be summarised as follows. The pressure will be to provide flexibility and quality:

- a flexible blend of modes of delivery;
- at times convenient to the students;
- in attractive, accessible, fit for purpose, estate;
- using up-to-date technology and other equipment;
- and with increasing use of distance e-learning, and delivery in local HE-standard facilities.

---

[15] OECD Report. 'New Technology and Its Impact on Educational Buildings.' Paris, 1994.
[16] Dobson, I and R. Sharma: 'Distance Education Failures Higher than On-Campus Peers.' Campus Review, Jan 17-23 2000: 3. Also, Virtual Education (see footnote 17) p75.
[17] The Changing Faces of Virtual Education, ed Dr Glen Farrell, The Commonwealth of Learning, Vancouver, Canada, 2001, p79 and p88. Referred to here as 'Virtual Education'.

The end of the traditional campus?

2.3.20 Is the current HE estate needed? How far will the move to distance e-learning and local delivery go? As Erhmann found: 'Many institutions are searching for a unifying vision to guide their investments in teaching, learning and technology. Some of them hear a thundering herd of innovations collectively referred to as 'distance education' and 'learning anytime anywhere for anyone' and wonder if their campuses even have a future.'[18]

2.3.21 It is unlikely, over the time-frame of this study, that moves to off-campus provision will be other than minor. Reasons for this include:

- academic staff do not change fast, and are not currently gaining the technological expertise (let along the pedagogical enthusiasm and expertise) to deliver to large numbers in this mode;
- materials are not yet available, development is largely piecemeal, and it is very costly to develop and to deliver (increased support by lecturers, licence fees to use library materials etc);
- there is a very large 'sunk' cost in HE estate;
- perhaps most importantly, students continue to need face to face support;
- most distance e-learning developments are 'cherry-picking' groups of mature, or work-based/vocational, students.

2.3.22 For the purposes of this study, it has been assumed that whilst distance e-learning will grow, it will not diminish the need for the current HE estate. And that estate needs to be of a reasonable quality, technologically up-to-date and fit for purpose, to attract and retain in particular both widening participation students and international students.

2.4 The HE sector

The number of institutions, and their location

2.4.1 There are 130 HE institutions in the UK, often several in one city. Some new campuses are in progress (e.g. The Peninsula Medical School), and there are other initiatives (e.g. the NHS University) and a growth in collaboration at various levels. A small proportion of HE provision is in FE colleges (currently about 5%).

2.4.2 Current national policies support greater collaboration and partnerships between institutions. These policies, along with increased competition for students and student funding, have led to some rationalisation of higher education provision through institutional mergers and collaboration. To date, these have not significantly affected the number of higher education institutions operating in England.

2.4.3 Although these trends are likely to continue, in the time-scale of this study

[18] S.Erhmann, 'Ivory Tower, Silicon Basement: Transforming the college', Washington DC, The Learning Technologies Group, 2000.

they are unlikely to impact significantly on the estate. However, they should lead to increased flexibility of provision and improved utilisation of the HE estate.

Types of institution

2.4.4 For the purposes of this report, it is not necessary to make assumptions about possible changes in numbers or classifications of different types of institution.

2.4.5 Infrastructure is increasingly important to all types of institution to meet next decade's challenges. This is not clearly stated in many institutions' academic strategies. Institutions should seek to establish an estates policy that supports the way they wish to deliver teaching, research and scholarship activities within specified discipline areas. The estates policy must address 'fitness for purpose'.

2.4.6 Institutional experience suggests that estates strategies will need to continue to evolve to meet the increasingly diverse needs of the student population. These include, for example:

- 'HE' estate created since ex-polytechnic or ex-Local Education Authority status in early 1990s;
- Learning Resource Centres (LRCs);
- ICT;
- establishing dedicated postgraduate and international student meeting spaces or rooms;
- renovating or reconstructing space to accommodate disabled access;
- increasing the space available for childcare services and other student support; and
- establishing newer and more numerous computer access points for staff actively engaged in distance or distributed learning.

2.4.7 It is clear that fitness for purpose will be affected by whether the institution is research-intensive, teaching-led or a specialist provider and by the disciplines concerned. This is particularly important in subject areas that require access to extensive laboratory and research-related facilities, studio and performance space, workshops and production facilities. In institutions with teaching-led or specialist missions, the location, number, size and technology available within lecture centres, seminar rooms and studios that facilitates the learning process may be a primary focus. Studies focused upon communication and other information technologies need well-serviced, modern and secure facilities that allow both individuals and small groups to develop their skills.

2.4.8 The requirements of specialist institutions and those with links to professional bodies are more exacting. For example, medical schools and institutions specialising in the performing arts have their own particular estates-based needs that are fundamental to the very nature of their provision. The design, scheduling and use of specific teaching and learning facilities are connected to curriculum requirements. Non-availability or inadequate condition of such facilities could result in the loss of professional recognition or opportunity by enrolled students and graduates.

2.5 The funding of teaching

2.5.1 Teaching is predominately publicly funded. Transparency Review figures show that nearly 90% of teaching activity is publicly funded (PFT), leaving just 10% as non-publicly funded (NPFT).[19] This will vary by institution.

2.5.2 In teaching, the unit of funding has reduced by 37% over a ten year period (see Figure 2 in the science report). Whilst this has led to significant changes in staff student ratios, and other 'efficiencies', it has also contributed to the tight financial situation that institutions now face. This has affected their annual spend on maintenance and other estates spend, and their ability to generate cash through surpluses for investment in capital estate.

2.5.3 The Transparency Review process does not require the allocation of income to activities. Nonetheless, informal data was produced for 1999-2000 which showed that: [20]

- publicly funded teaching activities are at break-even;
- non-publicly funded teaching activities are in surplus (around 30% of income);
- publicly funded research (PFR) is in significant deficit (around 50% of income);
- non-publicly funded research (NPFR) is also in significant deficit (around 40% of income);
- Other activities are in surplus (around 15% of income);
- institutions are making an overall deficit of around 7% of income.

2.5.4 The above results are consistent in their direction across the sector, but the more research-intensive institutions show different levels of deficit and surplus, with PFR and NPFR both showing around a 40% deficit on income, and higher surpluses in Other and NPFT activities.

2.5.5 The Transparency Review infrastructure adjustment suggests a gap in the accounting charges that are made to reflect use of the estate (i.e. depreciation) – the gap amounts to about 2.6% of total institutional costs. This supported other evidence– provided in chapter 2 of the science report – and is conservative.

2.5.6 A cost of capital employed (COCE) adjustment is also included under the Transparency Review. This incorporates an economic cost for the financing of assets; and allows funds for development and rationalisation of institutional activities. Some spend in this area is necessary on infrastructure if an institution is to be able to position itself to meet opportunities and challenges over time.

2.5.7 The Transparency Review COCE adjustment suggests an investment gap of

---

[19] HEFCE 15.01, 1999-2000 data, 24 October 2001. This assumes that all the costs of teaching students who are HEFCE-funded are allocated to publicly funded teaching, despite the fees students themselves pay.

[20] informal Transparency Review benchmarking data, 1999-2000, May 2001; corroborated by 2000-01 data, January 2002.

the order of 4.5% of current spending in terms of investing in the new capability that all businesses need for future competitiveness and productivity. This amounts to £0.5 billion a year. If half was assumed to be required for estates spend, this would indicate a need of around £250 million a year across the sector. Several 'big ideas' were identified in some case study institutions which would relate to this type of cost – new campuses, relocations, rationalisation of libraries, investment in e-learning. These are discussed in chapter 3 under the advanced infrastructure requirement for teaching.

2.5.8 The significance of these cost adjustments and the best evidence on levels of investment that institutions should be making in their physical assets is discussed in more detail in the science report.

2.5.9 Current higher education funding arrangements to support undergraduate teaching and learning in the UK relies on a mixture of government grants and student fees. A radical shift in the level of teaching resource could arise from an increase in government funding or, more likely, institutional freedom to set fees for full-time home students. This would have an enormous influence on the nature and type of provision on offer. In this report a continuing level of funding support for teaching and learning that is broadly similar to current levels is assumed. There is no assumption of provision by private institutions.

2.6 Pedagogy (contact time, group sizes etc)

2.6.1 Teaching methodologies are usually determined by the individual academic at the chalk-face. They in turn can be substantially influenced by the pervasive learning and teaching culture and norms that are established within the institution. For example, many older universities have always had learning environments based on small group teaching. In recent years, some new higher education institutions have sought to emulate this approach. There are certainly pedagogical arguments for small-group, project-based work (e.g. 'problem-based learning'), accompanied by an occasional large stimulating interdisciplinary lecture.

2.6.2 However, the continuing growth in student numbers along with a declining unit of resource has meant pressures on staff:student ratios. Both 'old' and 'new' universities have had to reconsider the resource implications of small groups and the space required to teach them. As a result, institutional teaching and learning practices across institutional types may be converging.

2.6.3 Beyond this, approaches to teaching and learning are, in many cases, shifting away from traditional lectures and seminars, although these are still widely used. With each shift, the institutional estates strategy must be prepared to support the learning process. For example, an increasing number of programmes of study are based upon student-centred learning, resource-based learning, work-based learning or problem-based learning approaches. In each case, students are expected to use their own initiative (alone or in small groups), supported by academic staff and resources to achieve the intended learning outcome. To support these learning approaches, institutions must ensure that students have direct access to learning resources including IT and software; designated space to support small group interaction, and discussion with peers and academics; and facilities, where appropriate, to support individual experimentation and studio work.

2.6.4 In light of the above, there are many issues to consider in the development of higher education estates:

Lecture rooms

2.6.5 Given increasing student numbers, increasing student choice offered through modular schemes and a declining unit of resource, it seems inevitable that students, at least in the early stages of their studies, will necessarily be taught in larger groups. There is doubt in some academics' minds as to the value of 'knowledge transmission' through large lectures, when e-learning could be facilitating this better.

2.6.6 Most academics still see the need for large lecture rooms. These lecture rooms will need to allow teachers to interact with students through the use of a range of multimedia technology including state-of-the-art projection equipment and facilities for laptops or integral hardware offering internet access, e-mail and other means of facilitating discussion, debate and assessment during taught periods. This technology would not replace face-to-face interaction. Instead, technology would be used to promote the learning process through better group communication and the availability of enhanced teaching aids including demonstration and simulation programmes.

Contact time

2.6.7 If computer technology becomes completely integrated within the learning process, it is likely that much teaching and learning currently delivered face-to-face, particularly at higher levels of study, may ultimately be offered through internet or intranet systems. If this were to become a reality, initial classroom/group contact time may decrease, freeing classroom or seminar space. Overall individual contact time between teachers and students may actually increase as direct contact via e-mail and dedicated discussion groups and forums take the place of classrooms. In this scenario, estates management strategies would need to ensure that ICT equipment and software were accessible to all students both on and off campus.

Independent study space

2.6.8 As more modules contain project (sole, or group) work, space is needed for student/s to work, preferably with access to ICT-based resources. Employability/key skills requires more student-directed learning, increasing use of group activities and projects – flexible space which students can use independently of tutors. Within this study space, student must have access to IT and software. This may be owned by the institution via a central server or provided by the student.

2.6.9 Working with computers requires probably twice as much space as without computers. Significantly, on-campus space must be designed with cabling, light, security and ventilation systems that allow students to work in a comfortable and ergonomically sound way.

2.6.10 Small seminar rooms where independent study or peer group discussion (or teaching) can take place, is increasingly important.

PC clusters

2.6.11 None of the above needs to imply the continued building and support of PC clusters/IT suites (currently, these are often in libraries, mainly for security and access reasons; or in discipline groups, yet used for social and recreation purposes). We are not talking here of specialist discipline-specific facilities. Open access PC clusters have usually been set up not for pedagogical reasons (it is by no means clear what students are doing in front of the computers), but for practical reasons of housing bulky, fixed kit somewhere, with adequate security and access.

2.6.12 Networked rooms, either with built-in screens, or with plug-in or wireless facilities for students' portable computers, may better reflect the technology and student expectations over the next five years.

Teaching laboratories

2.6.13 It is questionable whether there will continue to be the same need for teaching laboratories (e.g. in science) in future. Resource constraints have brought pressures from increased student numbers, without corresponding increases in laboratory facilities. This has led to potential overcrowding, health and safety hazards, inadequate supervision and reduced effectiveness of teaching. As the Oxford Centre for Staff Development put it 'The most common response has been to cut the number of laboratory sessions per course... Where they are retained there are very often severe timetabling and scheduling problems, with many students encountering practicals before the theory with which they are associated or in an illogical sequence, and experiencing theory unconnected with practice. Students are.. missing out entirely on practical experience.... The choice is a stark one: doing less of the same or doing something different.'[21]

2.6.14 Strategies for coping with more students in labs are considered by the above report by the Oxford Centre. These include using larger groups while planning, undertaking and writing up lab work. They suggest doing more outside the lab: 'many of the aims of laboratory work can be achieved as well or sometimes better, or in a more direct and explicit way, outside the laboratory or with modest use of laboratory facilities. The laboratory, because it is expensive, should not automatically be seen as the first option.' Students should learn how to use equipment from manuals, should design experiments before they use the laboratories, have prior briefing and debriefing outside the laboratory. Documentation and videos could replace repeated one-to-one explanations where possible. Demonstrations might actually be more valuable than hands-on experience. Equipment workshops could be used, to provide a practice setting to achieve basic competence in the use of equipment, but outside the laboratory's experimental environment.

2.6.15 With increased use of technology, it is probable that many demonstrations and simulations currently conducted in teaching laboratories will be delivered through some form of multimedia: computer-based simulations, data-analysis exercises. Home experiment kits are used by the Open University (and their students manage with a fraction of the formal laboratory time that is normally

[21] Developing Teaching – Teaching more students: 7 Labs and Practicals with more students and fewer resources. G Gibbs et al, Oxford Centre for Staff Development (Oxford Brookes University) 1997.

assumed necessary). However, many academics believe that technology will never replace much of the inherent learning experience of the laboratory.

2.6.16 What is required is a review of the aim of the laboratory experience. In discussions with academics the study found widespread reluctance (with some notable exceptions) to review the use of laboratories more fundamentally.

Residences

2.6.17 Probably a third of all students are in residences, and this plays an important part in their learning experience. The quality of this accommodation and associated ICT are important considerations. However, these are outside the scope of this report.

Summary

2.6.18 Perhaps the most important message is the need for flexibility. Classrooms need to be flexible so that they can be used for a number of different HE experiences. Students have formal contact time for only perhaps one-sixth of their (self-directed, independent) learning. There is perhaps formal seating for only one-third of students in an institution at a time. E-learning will facilitate flexibility, but so too must existing buildings.

2.7 Structure of the curriculum and the academic year

2.7.1 Since the early 1990s there has been a dramatic increase in the development and availability of programmes of study offered on a modular basis. In offering these programmes, institutions believe they are providing students with greater access, choice and flexibility within their chosen fields of study. Institutions adopting modular provision also intended that this new approach to teaching and learning would result in cost savings through efficiencies in the delivery of coursework. However, in practice these economies were often difficult to realise due to problems in finding or adapting existing teaching space to meet the needs of large student groups (along with increased staff costs associated with the administration of the schemes and increased assessment and examination requirements).[22]

2.7.2 Although no single model of modularity has been adopted across the UK or England, several characteristics of modular provision are shared across most schemes. These include the development and use of discrete units of learning based upon specified learning outcomes, the accumulation of credits earned upon the successful completion of modules, the use of continuous assessment practices within modules, awards schemes characterised and defined by minimum credit values, and the development of transcripts to record student achievement.

2.7.3 Modularity has had an undeniable impact upon the nature and provision of higher education in the UK. Its pervasiveness across virtually all higher education programmes of study is testimony to its perceived advantages

[22] Professor David Watson, 'Modularity: For and Against'. HEQC Modular higher education in the UK. In focus. 1996.

within the learning process. However, in establishing this type of provision, institutions have recognised that modularity has led to increased pressure on staff, library resources, studio and laboratory space, and upon equipment and technical personnel.[23]

2.7.4 Modular schemes, particularly those that allow common modules across pathways or degree programmes, have also had a role in the growth of larger teaching groups and class sizes. This in turn has led to greater pressure to build, adapt and generally make available an increased number of larger meeting rooms and lecture spaces to meet teaching requirements.

Structure of the academic year

2.7.5 The structure and organisation of the academic year has a significant impact on the development and use of the higher education estates and resources. The Flowers Report published in 1993, recommended that institutions move towards semesterisation based upon two 15 weeks blocks of study. That report also recommended, despite the lack of support within higher education institutions, extending the academic year to cover teaching during the summer months. These recommendations were based upon arguments supporting both pedagogy and efficiencies in the management of higher education resources.

2.7.6 The Dearing Committee also considered the structure of the academic year and concurred with the recommendations of the Flowers Committee. Specifically, Dearing noted, 'Different models for using the full year and institutions' estates more intensively will maximise student choice and increase lifelong learning opportunities. These may be particularly relevant to institutions which are not heavily engaged in research, although we would expect all institutions to give attention to the possibilities'.[24] More recently, HEFCE commissioned a study based upon a pilot scheme to extend the academic year.[25] Findings from this three-year study were largely inconclusive, particularly as they relate to value for money, but they do suggest that an extended academic year could enhance part-time, accelerated and continuing professional development opportunities. It may also enhance access for some under-served student populations whilst giving participating institutions a marketing advantage over some competitors. However, staff opposition towards developing this type of provision remained a significant obstacle for the future.

2.7.7 Pedagogically, arguments in support of extending the academic year largely focus upon widening student access and opportunities. In terms of estates use, these arguments are grounded on the belief that the teaching infrastructure, including learning resources, is under-utilised. While this view does not take account of essential repair and maintenance works undertaken during the summer, research activities, or the alternative income-generating

---

[23] Patricia Gregg. 'Modularisation: What academics think'. HEQC Modular higher education in the UK. In focus. 1996.

[24] NCIHE. Higher Education in the Learning Society: Report of the National Committee. Main Report. July 1997 p233.

[25] HEFCE 99/70: 'Changing Times: the extended academic year experiment. Segal Quince Wicksteed. Dec 1999.

use of buildings and equipment by external users, it does suggest there is continuing and perhaps growing interest in extending the academic year. Not all approaches to achieving this aim require year-round campus-based access. For example, one model of provision being considered would offer summer coursework but only on a distance-learning basis. This approach may or may not require on-site academics. It would require estates managers to ensure that virtual access to resource centres, staff and academics is developed and maintained throughout the year.

2.8 Libraries and learning resources

2.8.1 Libraries are a vital part of the learning environment, not only as custodians of books and journals, but providing access to electronic resources – both the university's own and elsewhere. They also provide study areas and PC clusters, and training in information retrieval. 'The library is the boilerhouse of an institution.' Library buildings are seen as flagships of (particularly new) universities, and of course library materials are a fundamental resource of research institutions. All this has meant great pressure on libraries. There have been pressures on costs – discussed in section 2.5 of the science report – and on space.

2.8.2 As pedagogy shifts towards student centred learning and problem-based approaches, there is an ever-increasing reliance on extended learning resources and materials currently available within institutional libraries and learning resource centres. These learning resources are largely subject-driven but generally include paper-based and electronic books, periodicals, catalogues, multimedia knowledge materials and CD-ROMs. More widely, the staff who assist students and academics in navigating through these materials are also a valued learning support resource.

2.8.3 In 1993 the joint English, Welsh, Scottish and Northern Ireland Funding Councils set up a committee to make recommendations on the future need for additional and different library space. The Follett report was well received by the sector and the funding bodies. Its recommendations to increase capital and other forms of investment in order to extend, modernise and improve library facilities and services across higher education institutions are still being felt today.[26] Subsequent discussions[27] suggest that librarians see the role as well as the fabric of learning resource centres shifting dramatically towards greater and different kinds of usage in the future. The key factors motivating change are largely those identified throughout this report. These broadly include:

- increases in the number and diversity of entrants;
- changes in approaches to teaching, learning and research; and
- increased use and reliance upon ICT.

2.8.4 Those responsible for managing learning resource centres believe there will continue to be a need to maintain traditional services associated with mainstream library functions. Primary amongst these functions is acting as a

[26] HEFCE C17/94: Joint Funding Council's Libraries Review Group Report: Implementation (July).
[27] Royal Institute of British Architects, 10.10.95

repository for the institution's secure holding of materials, offering students and academics skilled support in accessing these materials and providing individual reader places. These services have been substantially enhanced through the lengthening of opening hours, increasing access to IT equipment and support, the availability of extensive software, including on-line catalogues, and the reconfiguration of floor space to accommodate both individuals and small group learning.

2.8.5 These centres will continue to evolve as flexible spaces to meet the changing requirements of the institution and its approaches to learning. Flexibility in this context allows for different types of computer access points; different types and sizes of learning spaces; a dedicated strategy to purchase various multimedia packages as well as catalogues and subscriptions; 24-hour 7-day computer access to resources; innovative approaches to dealing with more students from diverse backgrounds; and continuing investment in academic support staff to assist students to navigate through these newly acquired resources. Institutions will also need to address how they will maintain the security of these systems.

2.8.6 Some individuals are forecasting the role of libraries as 'custodians of all knowledge materials'. Rather than the same information re-created and re-presented for different courses or use, knowledge materials could be created in standard forms, and used for a variety of purposes. (Promotion of metadata standards will facilitate this.[28]) The libraries/information services department might be the suitable repository/expert siting of such knowledge, or the centre responsible for facilitating access to it from inside and outside the university.

2.8.7 In its most recent Vision Paper[29] the Society of College, National and University Libraries (SCONUL) largely underlined the themes asserted above but has brought them forward to the academic library of 2005. This vision broadly suggests several planning assumptions that will likely have an impact on the future development and role of academic libraries and resource centres in future. With regard to higher education, SCONUL notes: 'we predict continuing diversification in the sector, with an increasing requirement to widen participation and extend services to meet the expectation of a 24-hour society.' For learning and teaching SCONUL suggests that 'the concept of Managed Learning Environments will expedite inter-working of library management and other systems, and the notion of an e-university suggests both collaboration and competition with the private sector.'

2.8.8 From an estates perspective SCONUL anticipates a diverse, consumer-led student body that will expect unprecedented access to learning support and resource centres. They further expect much of this support to be accessed from remote locations, including campus-based computer laboratories, designated learning centres, collaborating institutions and the workplace. Significant implications towards the establishment of this future will be computer access and compatibility with other systems as well as its costs at a time of increased efficiencies and economies. This cost must include up-skilling academic support staff as well as the purchase and integration of hardware and software. Funding requirements to ensure this future is realised may mean other priorities and services (e.g., subscriptions) may suffer.

---

[28] e.g. the IMS Global Learning Consortium: www.imsproject.org

[29] Vision 2005, SCONUL, January 2001.

2.9 Information and communications technology

2.9.1 ICT has been raised already in this report. It is also covered in section 2.4 of the science report. The key issues for teaching are:

- the use of managed learning environments (MLEs) or virtual learning environments which most institutions have or will have by 2010. These will have been incrementally introduced (as systems are replaced over that time) and their use is currently unexploited for teaching and learning. Currently 'powerpoint slides are hung off the universities' MLEs' whereas their role should be much greater – linking to the educational process and facilitating the management of learning;

- the fast pace of technological developments, and decline in costs. However the need to upgrade and extend capacity and functionality, and the short life of much IT, has led to significant cost pressures;

- the wide bandwidth available in many HE institutions (although not available to all academic staff, let alone students) instigated for research, but now offering network capability for multimedia and video streams. This allows much more student-friendly learning materials to be prepared and transmitted, rather than just the text and static graphics. However, new capability (e.g. moving images) will lead to vastly increased load on campus networks;

- the opportunities for communication with such technologies as satellite technology, and voice and text translation and speech recognition software. 'The importance of this (latter) development is that it will change the nature of interaction with computers. Word commands will make it easier to operate a computer, particularly for people with relatively low literacy skills. This, in turn, will have major implications for the design of learning materials.'[30]

- the emerging personal digital assistant (PDA)/mobile communications and PC devices that might replace the mobile phone and personal computer. Mobile telephones that allow text messaging are already hugely popular with students, are readily available, technologically understood and increasingly affordable. If this continues, and if it is fully exploited by higher education institutions, these technologies could eventually replace traditional PCs along with their associated terrestrial costs (e.g., cabling and space) and further enable remote system users;

- already wireless networks are being introduced – 'at Monterrey Tech campus students obtain a small chip to put in their laptops to enable wireless internet access anywhere within their campus environment. The technology is cheap and will become cheaper. This means that learners will have great mobility and will be able to access learning while travelling or in a cafe without having to be hardwired.'[31]

2.9.2 These all offer opportunities, but there are significant costs.

---

[30] Virtual Education (see footnote 17) p40.
[31] Ibid. p40.

2.9.3 The increasing use of, and reliance on, existing and emerging technology in teaching and learning is a massive growth industry that is supported by several sector-wide bodies including the Funding Councils, the Joint Information Systems Committee (JISC), the Learning and Teaching Support Network, the Institute for Learning and Teaching (ILT) and the Association for Learning Technologies. The funding bodies promote the use of ICT within learning and teaching by funding long-term projects such as HEFCE's Computers in Teaching Initiative (ended in 2000), the Teaching and Learning Technology Programme (TLTP) and the Teaching Quality Enhancement Fund. JISC also offers funding support to institutions through various initiatives such as the Access to Teaching and Learning Resources and their project Enhancing JISC Data Services for Teaching and Learning. All of these initiatives support institution or consortium-based projects that seek to integrate and exploit communication and information technology into teaching and learning practices.

2.9.4 The ILT, as a national but non-funding professional body, supports a wide range of higher education teaching practices that enhance the learning process. Accordingly, the membership of the ILT has a clear interest in supporting the integration of technology into their teaching and learning activities. This interest is manifest in the Institute's maintenance of the CTI's publication *Active Learning in Higher Education* and its archive. This publication is a leading UK-based refereed journal published 'to promote educational innovation and good practice in the use of learning technologies'.

2.9.5 Although these agencies continue to support the development and use of ICT technology in the delivery of higher education curriculum, they do so with the knowledge that a review undertaken of the TLTP programme in 1996 concluded that 'academics primarily see the benefits of electronics-based learning as providing additional support for students, not as a replacement for traditional teaching methods.'[32]

2.9.6 New models of how ICT may be used to support learning are being developed and discussed. The approach set out in Figure 2 below is based on a staged method towards learning where ICT becomes an increasingly important tool in the learning process.[33]

2.9.7 There seem to be two major drivers of the application of learning technologies.[34] Firstly, with resource constraints, increased class sizes have diminished the student experience, and academics can see in web-based learning the chance to bring back increased student interaction and access to resources that can free up the teacher's time for more direct time with individual students. 'We have been living under the economics of education whereby there are not enough teachers for one-on-one education. That has changed, but it is yet to be understood.'[35]

---

[32] CVCP 'Our Universities, Our Future' evidence to the NCIHE, Section 3: For Learning Sake; the potential of information systems. Nov 1996. p3.

[33] The Costs of Efficient Teaching, report for SHEFC Prices Working Group. JM Consulting Ltd. December 2000. p26.

[34] Virtual Education (see footnote 17) p42.

[35] Professor Schank, director of Northwestern University's Institute for the Learning Sciences in Illinois, speaking at a symposium on virtual universities in Cambridge, August 2001. As reported by the Times Higher 'Learners Must Play Leading Role' 31.8.01. Details: Institute for the Learning Sciences: www.ils.nwu.edu

Figure 2 **Possible stages in the development of ICT in teaching and learning**

Stage	ICT
1. enhance existing T&L materials	Productivity tools: word-processing; spreadsheets; communication tools; video conferencing; e-mails; access to on-line journals and databases.
2. provide additional T&L support (complement existing provision)	Increased use of student ICT-based resources to support teaching; reading lists and FAQs on web; more extensive use of e-mails; some ICT-based lecture notes; material stored on Local Area Network (LAN) servers with access via institutionally sited PCs; significant digitalisation of slides.
3. facilitate move from T to L (transforming the curricula and assessment)	Development of web-based knowledge materials; interactive learning materials; web-based environment (no longer dependent on LAN servers) using virtual learning environments; all lecture notes on web; collaboratively produced transferable materials; some on-line assessment; open access/listen-in discussion groups.
4. significant replacement of Teaching	Web-based courseware, significantly replacing Teaching; multimedia materials with embedded sound, videos and animations; simulations; interactive problem-solving materials; automatic feedback on work.
5. almost total replacement of Teaching: leading-edge technology	Intelligent response to students' learning; intelligent tutoring systems (adaptive coursework) which customise 'lessons' to a student; virtual laboratories; face-to-face electronic communication by students in groups that is of similar quality to that with a physical presence.

2.9.8 Secondly, the students themselves. Many students now entering universities and colleges have lived all their lives in a computer-based society. They have been playing computer games, using the internet to listen to popular music, and using mobile phone technology, as well as using ICT at school and FE college. Increasingly, they are expecting their education institutions to 'get on with it.'

2.9.9 Many academics also believe that it will improve the quality of the learning experience. 'Dissatisfaction with the 'irrelevance' of the education system

would force institutions to embrace technology that allowed students to 'learn by doing' – traditional lectures might have made sense centuries ago, but were no longer appropriate.'[36]

2.9.10 The newness of the technology has introduced great unknowns into the process (the world wide web itself did not exist as a public service before 1990). 'Because the application of the web to teaching is so new, there are very few convincing research and evaluation studies that indicate clear educational benefits for such an investment.' Used in the right way, for the right students, 'there are important educational benefits to be had from the use of ICT in education. However, for these benefits to be achieved, a major effort is needed to provide suitable levels of investment, adequate training, and a restructuring of the teaching process.'[37]

2.9.11 Whatever model eventually takes us into the future, it is clear that estates strategies will need to accommodate access to computers, computer studios, software and other multimedia based resources on a broader basis than ever before. Whilst many of these future requirements will be developed as part of learning resource centre strategies, other requirements that support basic communication across departments, schools and faculties are already being addressed, as computer use by students is now the norm across most discipline areas. In continuing to address future needs, the access requirements of both staff and students will need to be continually re-assessed. This takes on a particular import where distance learners, potentially one of the fastest growing groups of non-traditional students, are enrolled.

2.9.12 Other ICT developments that could shape future estates are more closely linked to existing buildings and teaching rooms. These include cabling teaching spaces such as lecture and seminar rooms for internet access; installing projection equipment where demonstrations and simulations may be used to enhance learning; and providing teachers and students with the technology necessary to take advantage of these learning tools (e.g., keyboards, computer access points, flip-screens). However, it should be pointed out that not all existing teaching space is currently appropriate for these technological adaptations. Estates strategies would need to evaluate whether individual rooms could support such technology in terms of ventilation, light, security and physical space requirements.

2.9.13 For the purposes of this study it is assumed that e-learning will become an integral part of every programme, resulting in pedagogical benefits. (This will not result in cost savings in terms of staff time – 'what virtual education is offering is a more interactive education encouraging critical thinking, communication skills and flexibility for both students and teachers'[38]). ICT will not just be a conduit for information dissemination (there is no advantage over a lecture), but will involve student-to-student, and tutor-to-tutor, interactions. There is a distinction here between the use of ICT to enhance individual learning, and its more fundamental impact in new forms of interactive e-learning. Both will be important.

---

[36] Schank, as above.
[37] Virtual Education (see footnote 17) p43 and 44.
[38] Ibid, p44.

2.9.14 Therefore as a minimum this will require the use of - PowerPoint lectures and material; lecture notes on-line (e.g. updating student PDAs at the beginning of a lecture); access to library materials; e-mail discussion groups; e-mail submission of assignments; e-assignments. In many cases this will also include e-tutorials, virtual laboratories and multimedia material. The infrastructure requirements could be (broadly) assumed to be power-point facilities with data-projector and PC in every lecture and seminar room; some rooms with sound and video equipment; bandwidth that will deal with video-streaming; networking that allows access by PDAs (or the equivalent).

2.9.15 Extending e-learning throughout institutions looks an almost inevitable step – not to say essential for an institution such as a university. However, an important prerequisite would be the expertise and enthusiasm of academic staff, coupled with the time both to train and to develop the material. 'The web and internet require a fundamental rethinking of teaching practice.'[39] Letting '11,000 flowers bloom' is not the way to take this forward.

2.9.16 Development costs will be significant ('the authoritative literature now concedes that far from being a cheaper alternative in educational applications, virtual education has high development costs'[40]). Support structure would be needed (experts trained in electronic material development, help desks for student queries, etc):

> 'Learner support in both on- and off-campus situations is labour intensive, as with any quality customer service. Yet the costs of not providing such services are even greater in terms of student frustration and failure, wastage of institutional resources and the immeasurable loss to any society of a citizenry lacking the education it desires. These issues suggest that most educational systems will need to maintain dual systems for some time to come: maintaining print-based systems and building, cautiously, the capacity of their institutions to utilise virtual forms of student support. They must also provide professional development for their teaching and administrative staff.'

2.9.17 The funding of infrastructure is only a part of the issues to be overcome: 'the technology is changing more rapidly than our abilities as humans to accommodate it.'[41]

2.10 Other support to teaching and learning

Student support

2.10.1 Pastoral support is required both from academics and from student services (finance, careers, welfare, crèches etc) – and particularly for non-traditional students. This requires space and in some cases (e.g. careers education)[42] ICT. The 'removal of all cubby-holes' and increasing pressures on academic

---

[39] Virtual Education (see footnote 17) p42.
[40] Ibid, p89.
[41] Ibid, p41.
[42] Careers Services: Technology and the Future, CSU, 2001.

offices has the potential to prejudice the quality of this essential support service.

2.10.2 Other aspects of the student experience include the students union, café, and the various student welfare and support services. These play important roles, and their integration into students' learning experience will be even more marked if there is widespread use of mobile computers/communication devices.

2.10.3 Disability issues have been raised in particular with the application of the Disability Discrimination Act to HE. Some funding from HEFCE has been helpful in taking forward some of the changes needed. This money, however, is recognised by institutions as inadequate. Disability surveys are now being carried out. One of the main problems is deciding what constitutes compliance with the legislation (and case law will be required here). Needs vary significantly depending upon the type of disability. Institutions of course wish to do the maximum possible to address needs, but funding levels will constrain them. This has an immediate impact on the access to HE for disabled students.

Academic support

2.10.4 The whole issue of the selection, induction, management, development and review and motivation of academic staff and others who support them is a critical area for higher education. The current HEFCE initiative on human resources strategies (HEFCE 02/09) has helped institutions to begin to address this in a systematic and strategic manner which has generally been missing in the past. The success of this is central to many of the developments discussed in this report, but it is outside the scope of the study.

2.10.5 At the level of physical infrastructure, the need for adequate offices for academics, with room for pastoral support was mentioned earlier in this chapter. Another significant issue is the employment of part-time teachers. Such lecturers rarely have offices on campus. If institutions move them onto a sessional basis of employment, the need for office space will need to be reviewed. Note that part-time teachers also have pastoral responsibilities, and similar needs as covered above.

2.10.6 Many of the changes in pedagogy (and ICT) will require quality training for academics. This requires time and trainers, but also quality space in which to carry out the training.

2.11 Space utilisation

2.11.1 Several issues have already been touched upon that impact on space utilisation (how much space is used over the year, and at what levels of volume):

- growth in HE (past, and future);
- rationalisation/mergers;
- the length of the academic day/week/year;
- flexible hours;
- flexible space.

2.11.2 On average, higher education institutions spend approximately 12% of their income on their estates.[43] This increases to nearer 20% when the Transparency Review cost adjustments are added in. This level of expenditure, combined with space-related pressures from increased student numbers, has resulted in greater institutional interest in the allocation, utilisation and management of available space for teaching, research and other academic activities.

2.11.3 A 1996 National Audit Office (NAO) report[44] suggested that the overall utilisation of teaching space in higher education institutions was approximately 20-30%. This figure dropped to 19-22% when only lecture theatres and laboratories were taken into account. The report suggested that a target utilisation of 50% would be a challenge for the sector to meet. However, the NAO did acknowledge legitimate limitations on improving the utilisation rate. These limitations included the use of specialist facilities, other demands on staff and student time and the structure of the academic year. The Association of University Directors of Estates in responding to the National Committee of Inquiry into Higher Education estimated that a maximum utilisation rate of 35% could be achieved and this would be considered an efficient use of estates within the structure of the current academic year.[45]

2.11.4 However, there are considerable challenges in even this target. Design and workplace strategy consultants DEGW comments that:[46]

> 'The notion that HE space is under-utilised is accepted as valid across the sector and the general consensus is that the situation has not improved significantly since 1996. It was noted, however, that utilisation studies have generally focussed almost entirely upon centrally controlled teaching space although this often only represents a small proportion of the overall amount of space occupied by the institution.'
>
> 'There should be a move towards a much broader review of the utilisation of all space within the institution, particularly as support and social spaces (such as libraries, cafeterias, students unions) become increasingly important as collaborative learning spaces. Concerns were raised about the increasing mismatch between the physical spaces and the way that teaching is taking place – some spaces are becoming unusable and this will be reflected in an extremely low utilisation rate for those spaces.'

2.11.5 Of course, rationalisation of space, to release poorly used space (and perhaps dispose of it) often has significant cost implications.

2.11.6 Improvements in space management practices and procedures have been supported by good practice publications developed by both the National Audit Office and HEFCE.

---

[43] HEFCE 00 04: Estates Strategies: a guide to good practice, p5.
[44] The Management of Space in HEIs in Wales, National Audit Office, June 1996.
[45] Higher Education in the Learning Society (the Dearing report), Main Report, Chapter 15, 1997, p231.
[46] UK Higher Education Sector Space Study: Maximising the effective use of the estate, DEGW, October 2000.

2.11.7 These publications strongly encourage higher education institutions to develop estates strategies that are linked to both mission and corporate plans in order to facilitate space management and allocation procedures. Additionally, the NAO guidelines identify central and computerised timetabling as well as space charging as 'techniques well suited to higher education institutions'.[47] HEFCE's Funding for Poor Estates initiative encourages institutions to provide 'evidence of good practice in space management (such as survey of use, central timetabling and remodelling exercises)' as part of the submission process.[48]

2.11.8 HEFCE's Space Charging Report in 1999 has assisted institutions in thinking through these issues, based on the premise that space charging provides incentives to users to actively manage their space. The sector's Estates Management Statistics (EMS) database has helped focus on the management information that is essential to good space management. This is increasingly focussing on the issues of:

- better measurement of estates utilisation;
- the linking of space management to estates strategies, development plans, and other institutional plans such as financial strategies.

2.11.9 Improved space utilisation is the aim of most institutions. Many have adopted such policies as centralised space charging where they have seen that this would help. Another factor in maximising space utilisation rates is room/space functionality (e.g., fitness for purpose). This has traditionally been perceived to be problematic in higher education institutions where many rooms are located and fitted to meet the needs of specific disciplines. Findings from EMS show that 42% of estate is considered by institutions to be unsuitable for purpose (see chapter 2 of the science report).

2.11.10 For those institutions with inflexible or inappropriate teaching space, costs for re-adapting or remodelling can be significant. This can be particularly problematic at institutions that maintain old buildings or are based at confined sites. However, other options may not yield cost savings. For example, the costs of setting up and removing technical equipment in order to share space may become prohibitive as well as impractical to manage. In addition, some space, for example that used for research or studio work, is not always appropriate or cost-effective for use as teaching space.

2.11.11 DEGW identified that there are cultural issues that need to be addressed if space utilisation and management is to improve (it is a cultural, not estates issue). Space is still seen by many academics as a 'free resource', there is strong department territoriality in many areas, and there are often no incentives for academics to give up unneeded space or rationalise the space allocated to them. DEGW also found that in many institutions estates issues are generally given low priority by the senior management team unless there is a problem or an opportunity for a new building. In general the coverage of estates issues in the business plans of HE institutions is not robust – the need to ensure that the physical estate will be able to deliver the 'business objectives' is often not thought through.

---

[47] National Audit Office, Space Management in Higher Education: a good practice guide. June 1996. p2.
[48] HEFCE CP 3/97, Funding for Poor Estates and Laboratory Refurbishment. June 1997.

2.11.12 Recommendations from the DEGW work included improvements to the communications channels and strategic plans for estates, linking estates indicators to relevant business-related indicators, and understanding the link between academic (and student) performance and the physical estate.

2.12 Conclusion: teaching, learning and infrastructure

2.12.1 This chapter summarises the changing nature of teaching and learning, and the implications this may have for requirements for infrastructure. The overall context for this can be summarised as follows:

a. teaching and learning is the core business which every institution has to do well;

b. unlike research or commercial activities of universities, the paradigm for teaching and learning allows a wide range of approaches to its management. For example:

- there are wide variations in staff:student ratios and approaches to teaching and learning, even within a discipline;
- there is no real strategy driving teaching and learning methods or infrastructure use (these are based significantly upon staff wishes/experience);
- there is no consensus about 'what works' – there is huge variation in the learning blend experienced by students;
- by business standards, infrastructure is not well adapted to needs and is poorly utilised;

c. these features are not necessarily a criticism. Some would see them as a strength of UK higher education; in international comparisons of effectiveness, UK HE does well (low cost, high retention and progression, good reputation).

2.12.2 One of the most significant policy issues for this report was remarked upon by DEGW: 'One of the major problems when trying to convince institutions to use space more effectively and to develop comprehensive real estate strategies is that there is no established connection between poor buildings and poor academic performance.'

2.12.3 However, the connection between staff and student recruitment and infrastructure is increasingly being made, and institutions will be required to become more strategic in their management of infrastructure and its impact on their academic performance.

2.12.4 Finally, there will be continuing changes, and these have implications for infrastructure:

a. student numbers will rise – and much of this growth will be in non-traditional students (access groups, or mature/life-long learning);

b. there will not be an equivalent increase in staff numbers or space (although there will be growth at the margins);

c. there will be developments in teaching and learning methods, the use of ICT, off-campus learning, and mergers/collaborations, etc, but this will be incremental, not a revolution.

2.12.5 Staff, not infrastructure investment, are key in ensuring that these changes are properly addressed, and to allow the implementation of any more radical change.

2.12.6 Overall, therefore, the main conclusions for this report is that existing infrastructure needs to be brought into a good state for 21st century HE and this will facilitate increased efficiency, widening participation, international competitiveness and life-long learning. As DEGW commented, there will need to be a vision of what a '21st century university' will look like. This will be up to each university to determine. With the current limited funding, few institutions have been able to create the vision required.

2.12.7 But the urgency is rising – the state of the building stock, competition, the need to attract target groups of students, recognition of resource constraints, the new capabilities offered by ICT – are all nudging institutions towards more strategic views of their estate. Flexible, well utilised, fit for purpose, accommodation is key. Some argue that the universities of the future will need to radically reshape their workspaces to survive and thrive.[49] A combination of a more strategic approach in institutions and a more supportive funding and financial climate is required to enable this essential investment and renewal.

2.12.8 Without prompt action, there is a danger that real financial damage will be done to the UK HE system and economy, and that the remedial action that will eventually have to be taken will be much more costly.

[49] Clive Holtham, Professor of Management Information at City University in London, article published 30 June 2000.

3 The teaching infrastructure

3.1 Introduction

3.1.1 This chapter considers the state of university infrastructure and its fitness for purpose in relation to the requirements considered in chapter 2.

3.1.2 Need is considered against each of the capital investment categories. Firstly the HE estate and its funding are briefly described, drawing particularly on material in the science report.

3.2 The value, financing and condition of the estate

3.2.1 This subject is covered in detail in the science report. Key points are as follows:

a. teaching infrastructure comprises 60% of total HE estate (excluding residences) – nearly £16 billion (insurance value), or over £20 billion if equipment is included. This provides teaching and learning for a current student population of nearly 2 million;[50]

b. approximately one-third of the HE estate has an Exchequer Interest, although a higher proportion of this may have been provided with aid from public funds in the past. The proportion of new estate that is 'publicly funded' varies, but is probably approximately 40% at present;

c. approximately 50% of the estate was built in the 1960s and early 1970s, and much of this is in a poor condition and also nearing the end of its design life;

d. despite remedial funding schemes initiated in the 1990s, the HE sector has maintenance condition backlogs of the order of £3.5 billion (English EMS data) that are in need of major repair or replacement within three years;

e. additional requirements relate to making buildings that are in a serviceable condition and fit for purpose, and that are in compliance with the requirements of health and safety and disabled access legislation.

3.3 Capital funding of HE infrastructure

3.3.1 In the science report, 30 capital funding schemes were we analysed from the Funding Councils, Government and Wellcome Trust over the last 10-12 years (see Appendix C of the science report). A total of £4 billion was identified, made available purely for capital infrastructure – buildings and equipment (this does not include research centres or capital infrastructure funded

[50] see section 2.2.

through charitable, Research Council project or programme grants, not HEFCE formula-based annual capital allocations).

3.3.2 Of this £4 billion, £0.7 billion (or 18%) was targeted specifically at teaching and learning (and often arts and humanities research), and a further 18% could have been used for teaching and learning (or research). This is in the context that teaching accounts for 58% of an institution's core activity (with 42% being research).[51]

3.3.3 Until quite recently funding for capital investments to support the English higher education teaching infrastructure was based upon earmarked formula funding. Today this funding is captured within the institutional grant made available to each institution via HEFCE. HEFCE has also made other funds available to institutions, on a competitive basis, to improve estates. The first such programme, Improving Poor Estates, was established in 1998 following a consultation. Grants offered through this programme are 'targeted at major capital refurbishment and projects related to restructuring'.[52] Since its inception, nearly £300 million has been set aside to support capital improvements through the programme.[53] This initiative was also designed to support research activities through investment in laboratory refurbishment.

3.3.4 In a separate initiative started in 1999, HEFCE established a fund 'to improve the capital and IT infrastructure in support of teaching and learning'. Linked to HEFCE's Teaching Quality and Enhancement Fund, monies attached to this funding stream are allocated formulaically based upon institutional submissions that meet pre-specified criteria. While the funding is designed to support 'a small number of identifiable projects with measurable learning and teaching related outcomes', institutions are also encouraged to use these funds to prioritise capital improvements such as upgrading teaching laboratories and laboratory equipment; refurbishing teaching facilities; and updating audio-visual, engineering equipment and computer equipment, including networking costs for online learning. A total of £90 million has been set aside to support these programme aims over three academic years.

3.3.5 A further £158 million has since been allocated by HEFCE over 2002-04 to support the Teaching Quality Enhancement Fund, together with £56 million to address disability issues.

3.3.6 Funding to support the teaching and learning infrastructure through the integration and use of ICT is also made available through JISC. This support is offered across the higher education sector through funding for cross-institutional, consortia-led network-based projects. These include, for example, the development of SuperJANET and the digitisation of library holdings via the Distributed National Electronic Resource (DNER). In support of this latter initiative, JISC set up the Developing the DNER for Learning and Teaching in 1999. With earmarked funding of £10 million over three years, the purpose of this project is 'to improve the applicability of ICT for learning and teaching'.[54]

---

[51] Data for 1999-2000 required by the Transparency Review, HEFCE Circular Letter 15/01, as percentages of the total of the core activities of Teaching and Research only (not Other).

[52] HEFCE CP 3/97: Funding for Poor Estates and Laboratory Refurbishment. June 1997.

[53] HEFCE 01/13: Improving Poor Estates – Awards by the HEFCE 2001. March 2001.

[54] JISC Circular 5/99: Developing the DNER for Learning and Teaching. 5 November 1999.

3.4 Management of assets and infrastructure

3.4.1 At the institutional level, the planning for, investment in, and management of teaching and learning infrastructure has been a relatively undeveloped skill for a number of reasons, discussed in detail in the science report. These include the relative inadequacy of funding, and the way funding has been provided (for specific projects), but other cultural and environmental factors also contributed to the current position. The most relevant influences are probably:

- the past public-funded culture of higher education;
- the significant numbers of 1960s and 1970s buildings, which are already unsuitable in many cases, and near the end of their design life;
- perverse incentives in the way that capital funding of universities has tended to address specific projects and to reward institutions with poor infrastructure, which has not encouraged self-help and whole-life asset management;
- issues about the strategic management of estates, particularly in the more traditional research universities which have been led by academic officers, and which have not given priority to long-term estates strategy or to commercial property and investment skills;
- recurrent funding of research below full economic costs has put pressure on all infrastructure, including that for teaching, as research has grown in importance in many institutions in recent years;
- the absence of properly integrated academic and resource strategies in institutions.

3.4.2 Most of these factors have had an equal impact on both teaching and research. However, factors which may be considered to have particularly disadvantaged the teaching infrastructure include:

- the reliance on public funds for teaching with scope only at the margins, for a few institutions, to raise significant sums from private sponsors or private students towards infrastructure;
- the marginal costing of much of the growth in teaching over the last decade, with the resulting decline in the unit of resource for teaching;
- the changes post-1992 where the 'new universities' needed to create a HE estate often starting from a poor quality inheritance;
- some short-term problems in recent years as a result of institutions struggling to find matching funds for Joint Infrastructure Fund (JIF) and Science Research Infrastructure Fund (SRIF) projects in the sciences. These have had an adverse effect on the levels of investment that would otherwise have been made in teaching (and in the arts and humanities).

3.4.3 All this adds up to a picture where there is a now very significant requirement

for remedial investment across the whole higher education generic institutional infrastructure. Without the benefits of an equivalent to JIF and SRIF, teaching has a particular need for further investment.

3.5 Categories of investment need

3.5.1 In assessing the total investment requirement for teaching infrastructure, five categories have been used with the following definitions. The last two are not considered further in this report.

Generic institutional infrastructure

3.5.2 This is the level of institutional infrastructure required to permit appropriate teaching and learning. The most essential requirement here is appropriate space and facilities, i.e. buildings; services; equipment; libraries and IT at the generic institutional level to a standard summarised in the science report (section 3.2).

3.5.3 Although student accommodation is part of the learning infrastructure, this is not within the remit of this report. Standard specification staff and student PCs – including PC clusters – and office equipment would normally be part of the generic institutional infrastructure.

Well-found teaching environment

3.5.4 This is infrastructure in addition to the space and facilities required for the generic institutional infrastructure for teaching and learning. Two types are identified:

- teaching equipment (in lecture rooms, seminar rooms etc) in particular ICT equipment linking into the institutional network;
- discipline-related equipment used for teaching (e.g. in science laboratories, language laboratories, art and design studios).

Advanced infrastructure

3.5.5 This covers additional costly infrastructure that is either not needed in every institution, or is of a cost that could not be supported by any one institution within current funding methods, but provides essential capability for teaching and learning across the sector as a whole. Two examples of this are:

- region- or sector-wide distance e-learning provision;
- local HE facilities designed for new target groups.

Recurrent investment

3.5.6 This includes consumables and travel, but the most important recurrent investment is in academic staff time, particularly with the need for academic staff to be motivated and adequately equipped to take forward new teaching and learning methods. Unbundling of staff duties may happen more in the future, e.g. with academics developing the educational content of material

and technologists transferring to an electronic format, and delivery through academics but also call centre support. As discussed earlier, e-learning will not reduce requirements on staff time.

3.5.7 Technical support (for ICT, for new methods of teaching and learning) is also a critically important form of recurrent investment.

3.5.8 Recurrent investment is not covered in this report.

Continuing needs for investment and renewal

3.5.9 This is covered in the science report: annual maintenance (paragraphs 1.2.6 to 1.2.12), annual replacement and renewal (paragraphs 1.21.4 to 1.2.21) and equipment renewal and support (section 1.3).

3.6 Requirements: generic institutional infrastructure

3.6.1 This is the most significant category in terms of funding requirement. Even in science research where the other two capital investment categories (the well found laboratory and advanced infrastructure) are well developed and relatively well funded, the generic institutional infrastructure accounted for more than 80% of the total capital remedial investment needs.

3.6.2 Most of the research at institutions was therefore focused in this area. The process used was to seek evidence from institutions of the funding needed to bring their generic institutional infrastructure to a level where they have:

- adequate and suitable space for staff and students;
- buildings, plant and equipment that are in at least adequate condition; reasonably fit for purpose; and comply with essential legislative requirements;
- suitable institutional IT networks and equipment; i.e. with up-to-date equipment; adequate and expanding band-width; a minimum level of technical support;
- a library with adequate teaching materials; an adequate budget to purchase journals and books; access to other libraries where other materials are available; adequate reading spaces and on-line facilities to support staff and students.

3.6.3 Chapter 2 described the context in which infrastructure needs over the next 10 years can be viewed, and the importance of infrastructure in meeting institutional (and public) needs. The science report provides a detailed analysis of the existing evidence on the state of the physical infrastructure in higher education, and on the levels of investment by institutions in recent years. This evidence demonstrates a serious problem of maintenance backlogs, and of buildings that are not fit for purpose and that do not meet legislative requirements. The case studies revealed problems of under-investment in teaching in all of these areas.

3.6.4 Current infrastructure is not well adapted to support:

- new methods of teaching and learning;

- efficient utilisation of space and facilities;
- widening participation – to attract and support different types of students and to accommodate significant expansion;
- the international competitive position of UK – leading-edge facilities to attract best staff and students;
- key skills and employability – industry state-of-art equipment and facilities.

3.6.5 These issues need to be resolved if the needs of students, and of higher education in the UK, are to be met.

Buildings and space

3.6.6 In terms of buildings space, the quality and flexibility of accommodation is the biggest concern. The amount of space is also of concern in many departments, but as discussed above, space utilisation is generally poor.

3.6.7 The main concerns are to improve space so that it is:

- flexible – can be used for a variety of learning experiences, and can change over time;
- suitably adapted to modern teaching and learning requirements;
- attractive to youth and 'non-traditional entrants';
- in good condition and fit for purpose;
- in compliance with legislative requirements;
- providing adequate social space for students – especially part-time and mature students, who have different needs;
- providing up-market space e.g. for Masters students, postgraduate and research students;
- facilitating interdisciplinary work, scholarship and research that informs (and is informed by) teaching;
- attractive, enabling UK to compete internationally.

3.6.8 The requirement is not significantly for expansion, but more importantly for renewal and reconfiguration of space:

> 're-engineering space is absolutely critical. It is out-of-date now and will be abysmally so in a few years time'
>
> 'new methods of teaching and learning, and ICT, offer much to students, and there is a lot of scope to improve, it is all happening at the margins. But we are stuck in our infrastructure – the use of our rooms, timetabling, our exam structure. We can't implement our teaching and learning strategies because infrastructure is blocking us from achieving change'[55]

[55] two participants at the expert workshop on teaching infrastructure held for this review.

Examples

In **Institution P** the head of the school of cultural studies reported that their seminar rooms were too small and had not got the basic equipment. In this post-1992 university 'there is lots of funding available for innovative learning but nowhere to do it as they lack space and suitable rooms'

The director of estates in **Institution G** reported that the buildings are inappropriately configured, and the teaching rooms poorly utilised. He felt that they should concentrate their resources into fewer teaching rooms.

In the same institution, in terms of student services, they have a sports hall that is 'past its sell-by date', the students union needs a new debating chamber, and there is no disabled lift in the students union and poor disabled provision in the refectory.

In **Institution K** they need a new students centre (£23 million+) for all students services, the union, etc. 'to provide a vibrant heart, to underline the civic role of the university, to enhance the students' experience (intellectual, cultural, political, social and sporting life) – the development of an individual as an individual is as important as a university qualification.' They have also identified the need for new sporting and recreational facilities (£13 million+): ' strong and visible means of attracting students significantly to enhance the student experience, promote greater social integration through sport; contribute to the wider sporting community.'

In that institution they have tended to upgrade research laboratories, not teaching, because of the need to put in new equipment as new research staff are appointed. Their 1950s and 1960s labs are 'an embarrassment'. They get weekly complaints about dust, dirt and noise. The labs have teak benches. They haven't upgraded to support new teaching and learning methods. They also need to rationalise their labs – they no longer need one for level 1 undergraduate organic chemistry, one for level 2 undergraduate organic chemistry etc. The labs should be much more flexible. They have estimated the required spend at £10 million – we are 'not teaching with the infrastructure they are going to experience in the workplace. It is not appropriate to support work in a knowledge based economy.'

In **Institution S** they 'have bled money from estates maintenance into audio visual facilities. We need approximately £150,000 pa. for the enhancement of general purpose teaching rooms. We need to remodel them for increased student numbers... Over the years we have learnt that the key to improved utilisation is to make the teaching rooms more pleasant, e.g. students and staff more readily accept an early evening slot in a pleasant class room. Modest improvements to the stock of teaching rooms are more cost effective than providing new additional teaching rooms. We estimate this programme at £150,000 p.a. (but we could usefully expend double this).'

One university **(Institution G)** has a lot of space (as measured by almost all performance indicators e.g. sq m per student). However, not all of the space is fit for purpose, and the curriculum is designed to 'fill up the space' (small modules, extensive examination assessment, etc).

The main proportion of buildings in **Institution R** are 1960s/70s design and build, and are still equipped with the original equipment – tables, chairs, OHPs and whiteboards. Student numbers have expanded so that now seminars are typically 20 students in a seminar room designed for 15. 'Physical overcrowding is a real issue.'

In a small specialist institution **(Institution J)** staff accommodation is limited – they have recently converted many sessional staff to fractional posts which gives rise to the need for space. Staff space is also used for teaching. A recent survey of staff space requirements showed an extra 700sq m was needed, which has been costed at £1.5 million

In **Institution W** they have done a Disability Discrimination Act survey which identified a need for £4 million. They need £9 million to refurbish one site to rationalise space, integrate the faculty, refurbishment, convert mixed teaching/residential space to teaching, and improve the LRC so that the computer laboratories can be consolidated and then be opened 24/7 with secure access. They need another £17 million to knock down an 'appalling' building (huge backlog maintenance), and incorporate that academic faculty into the 'holes' now being made available on the rest of the campus. The building does not comply with health and safety, it leaks, it needs recladding and was in fact never completed 25 years ago (reinforcing rods are sticking out). It would also allow administration to be relocated to more appropriate accommodation.

A small college, **Institution N**, has problems with several of its buildings, e.g. a 1939 temporary single-storey structure, with a flat roof where heating costs and maintenance costs are high, lighting is poor, and drinking water is poor quality. A 1960s building, hexagonal, not fit for purpose, is built on a setting concrete raft, the walls are porous, the roof is leaking, there is no double-glazing nor disabled access. A 1970s/80s conference centre should be knocked down and replaced as an extension to the library. Two ex-hospital buildings have problems with drains and roof – need to build on top of them to realise their potential. Backlog maintenance includes a new management system for boilers, urgent health and safety (potholes, carpets which can be tripped up on), urgent refurbishments to roof, refitting showers, fences and door (security). Other improvements are small in terms of money required, but it just isn't available e.g. fixed seating in laboratories (students have to sit sideways to see); blinds do not give proper blackout so slides cannot be shown.

Learning resources

3.6.9 As described in the science report, increasing pressures on learning resource centres – libraries and PC suites for students – has led to infrastructure needs both in terms of buildings and learning resources material. The main needs here relate to space, books and materials, and access to electronic information.

3.6.10 As a draft QAA report[56] comments, the overall picture in relation to library services is variable, reflecting the differing institutional legacies and the financial resources available. Whatever the financial position of institutions, however, in most of them increasing student numbers are placing greater and greater strains on existing library provision. A number of institutions have

[56] draft report, summarising eight years of Review reports, Quality Assurance Agency, due to be finalised Spring 2002.

made efforts to anticipate and deal with the problems created (extending and refurbishing their buildings). However, the report found that the most common problems relate to book and journal stocks, which can significantly impact the overall quality of the student experience. On occasion, concerns had been expressed by reviewers about student access to library facilities (opening hours), with problems of inadequate staffing or other resource considerations. This can be a particular problem for mature and part-time students.

Examples

In some institutions, Follet and Poor Estates funding has facilitated the development of excellent learning resource facilities. **Institution P** has impressive learning centres, with some elements of a traditional library, but the focus is on learning – reflected in the provision of such facilities as multimedia, audio-visual facilities, and 24/7 opening hours.

Institution R is however, not untypical: the library has not changed (in the space available) since the university opened, but there are many more students. Necessarily, library spending per student has fallen.

Institution Z gives another fairly typical example. As part of the estates rationalisation programme, they have reduced the number of library sites from 9 to 4 (one on each campus) at the same time as retaining the staff and expenditure levels. Two sites have LRCs (Follett money helped to fund one). They believe their sq meter per space is 'nowhere' near 'HEFCE norms', nor can they meet Follett guidelines on reader spaces. At the same time they point out the changing requirement for the way the library is used – students no longer need a space just to look at a book, but need to reference text and screen at the same time – all this has implications for space.

3 6.13 Estimates of stocking libraries to provide 'adequate' numbers of books for current or future student numbers are not included in this report; however, as discussed in the science report, recurrent funding to facilitate this is an issue. Student experience is, too often, that 'the book is out'.

3.6.14 The costs of upgrading buildings and facilities (storage) were included, with sufficient space to allow for the modern concept of a learning resource centre (with PC suites, group discussion areas, quiet study etc). This is increasingly important with all the 'corners' in departments gradually being removed as more efficient space utilisation methods start to bite.

ICT

3.6.15 Bandwidth and the capability of ICT networks has been significantly extended over recent years, driven predominately by the needs of the research community. Although the driver may be research (and research groups may have access to the greatest capability), institutional ICT infrastructure is of great importance to teaching, with recent and forecast increased use of e-learning, and student-centred (resource-focused) learning methods.

3.6.16 There are significant challenges in keeping existing infrastructure up-to-date (with replacements or upgrading at least every three years). 'IT on campus is a bottomless pit' (Institution W).

Examples

Institution P spends about £2 million p.a. on IT enhancements to teaching and learning and to central management systems. They feel that about £5 million p.a. is actually needed, plus an additional £2 million to help develop new courses in an e-learning environment.

In the science report, **Institution Q** was reported as having generic IT needs of around £8.5 million, of which approximately £4 million will come from SRIF. The unmet need of £4.5 million includes server renewals, Metropolitan Area Network (MAN) re-procurement, new student clusters, video conferencing development, library OPAC workstations, self return station, disaster recovery machines and file-store upgrades, new software licences (e.g. a web-based query language for management information), video and other equipment. This excludes other more specific Teaching (audio visual) and arts and humanities Research (digital preservation repository) requirements, as well as proper funding of corporate systems. 'Assuming all of the current projects (e.g. upgrading HR) are funded, we should probably replace or seriously upgrade our student system, and put in enterprise integration software, as well as moving substantially towards e-business – none of these have been included in the above.'

This institution also quoted costs of £2 million as the 'thrust to e-learning start-up: mainly in support, pilots, staff development and training, acquisition of intellectual property rights, and materials development costs. There would be significant costs to link to corporate information to build proper student portals.'

3.6.17 There are also challenges and opportunities to be addressed from new technology – e.g. wireless networks – and developments in software – most institutions are introducing some type of managed learning environment although it is early days in terms of making full use of the functionality becoming available.

3.6.18 As discussed in chapter 2, challenges arise from the new mobility of ICT. Where does the student want to learn – home, students residences, library, classroom, PC suite, café – and on what device – new breed of computer/phone (PDA), TV or games console, networked screen with standard applications, powerful machine with access to greater bandwidth? Institutions The way forward is not yet clear for many institutions. Most are still adding onto their – greatly in demand – PC clusters/suites. Many expressed concern at the low ratio of computers to students. However, given the changes in technology, and opportunities for mobile devices, for the purposes of this report it is assumed that:

- the current ratio of computers to students is maintained;
- new PDAs will become available. Students will buy these themselves (a significant number of 18 year olds currently own a mobile phone which they have self-funded). These will be able to be plugged in on-campus and will have the capability for standard applications (and the features such as keyboard and screen size to make them useable for this purpose).

3.6.19 The costs of a computer per student/student group, or the funding of PDAs, were not included in this study's requirements.

3.6.20 General shortfalls in IT equipment, including in networking/communications, and in specialist PC clusters, are included in the GII estimates of remedial need (although these were not a significant element of the identified shortfalls).

Other institutional evidence

3.6.21 In addition to the evidence of infrastructure needs presented earlier and in the science report, other sources of evidence from institutions were reviewed – teaching and learning strategies, widening participation strategies and QAA reports. Whilst there was evidence of gaps from these sources, this was not expressed in terms that lead the reader to comprehend either the scale or the importance of the infrastructure shortfalls. There are two main reasons for this – poor strategic planning by institutions, and the image that they wish to present to the world.

3.6.22 Institutions would generally see QAA inspections as an opportunity for displaying the quality and strengths of their provision, and their infrastructure, and not the problems that they have with it. The QAA has found[57] that teaching accommodation has been judged by reviewers to be usually fit for purpose (a point of view that is not, however, supported by institutions' EMS data), although minor criticisms sometimes appear in the subject reports. These emphasised such matters as extraneous noise, heating or ventilation problems or rooms inappropriate for the activity or group size. There is a general sense of staff and students coping well in what are sometimes difficult circumstances. The reports present a mixed picture, and it is clear that many institutions have had to make difficult choices and have sometimes invested in other resources at the expense of teaching accommodation.

3.6.23 In terms of their own expressions of need, institutions are not good at linking academic and functional (finance, estates, human resources) strategies. It was noted in section 2.11 how DEGW has recommended improvements in linking estates to business needs, whilst acknowledging that the connections between academic (teaching) excellence and infrastructure quality are not strongly evidenced. This is clear from institutions' teaching and learning strategies, which hardly address 'infrastructure blocks' at all (over three-quarters make no mention to their estates strategy; a fifth just 'a mention'; only 2% make explicit links).[58]

3.6.24 Over 100 widening participation strategies (dated July or October 2001) were considered in this study. These were written to a template, which did not include infrastructure as a discrete heading (it focused on projects and initiatives). Many institutions saw the preparation of these strategies as ignoring their core mission (of widening participation), and therefore almost all did not cover infrastructure needs but focused on projects that could be funded under the (limited) funding made available. Those that did mention infrastructure requirements invariably raised the need for improved ICT, although many of these were just passing references. As discussed in

[57] see footnote 55 above.
[58] HEFCE internal analysis of institutions' teaching and learning strategies 1998-2000.

chapter 2, good quality infrastructure is fundamental to success in widening participation (alongside a wide range of other equally important tools)

The size of the gap

3.6.25 From the case studies a need for £4.6 billion of remedial capital investment was identified in the generic institutional infrastructure for teaching (see paragraphs 4.3.28 and 2.2.32 in the science report).[59]

3.6.26 This is an 'ideal' figure, which assumes, in particular, all estate is fit-for-purpose and well-maintained (in at least category B) condition, and no borrowings. In practice the degree to which these assumptions are appropriate can be questioned. It is a matter of policy perhaps, rather than fact, as to how 'good' an estate needs to be to carry out effective teaching and learning to the planned target groups over the next ten years. However, this would not diminish the overall significance of the need. It is of a magnitude that small amounts of funding 'on the margins' will not affect the gap. Significant funding is required. If this gap remains, teaching and learning will not be carried out in the modern, competitive, or fully effective way that the students of today and of tomorrow require.

3.6.27 To ensure that effective teaching and learning is carried out, the backlogs need to be addressed -- but in the context of a full estates strategic plan, linked to business needs. There is no point in just updating existing estates, believing that large lecture theatres and laboratories and PC clusters will continue to be required as they always have been. Space needs to be made fit for purpose, and its purpose needs review.

3.6.28 A review of this type should be done for the whole estate, i.e. along with that for research. It should be done alongside the re-engineering required across the whole 'teaching business' to make the most of the opportunities reconfiguration can offer to teaching and learning (covering curriculum, delivery, timetabling etc). This needs fully to recognise disciplinary diversities; and be student-focused, but also to take full account of the needs of staff. Given the potential costs of such a review, and its implementation across all aspects of the institution, institutions will only be able to do this properly if there is some expectation of an appropriate level of funding for the remedial need identified.

3.7 Requirements: the well-found teaching environment

3.7.1 Two aspects of the well-found teaching environment are covered: teaching equipment (particularly ICT), and laboratory equipment.

---

[59] Paragraph 4.3.28 of the science report identifies a backlog need amounting to 30% of the insurance value of the whole sector non-residential estate of £26 billion, i.e. £7.8 billion. Paragraph 2.2.32 of that report gives the split of that between teaching, science research and arts and humanities research. Space can be split between teaching and research in the ratio of 70:30 (see Figure 9 of the science report); when research space is weighted for its higher cost, this ratio becomes 64:36. Arts and humanities research, which partly occupies teaching space, accounts for some 6% of the total space, and is removed pro rata from teaching and research space. Therefore the final split between teaching, science research, and arts and humanities research can be calculated as 60:34:6. The backlog need for teaching is 60% of £7.8 billion, i.e. £4.6 billion.

Teaching classroom equipment

3.7.2 Gaps in upgrading student PCs (PC clusters) were broadly included under the generic institutional infrastructure discussed above. Spend for increasing the computer:student ratio was generally not included. There are issues about the need for general (not specialist) PC suites (see chapter 2) in future and alternatives such as wireless networking, and mobile devices, e.g. PDAs, were also discussed above.

3.7.3 Under teaching classroom equipment delivery equipment is therefore covered – in particular ICT, such as powerpoint-enabled PCs, data projectors, screens and video facilities. If the logic and assumptions in chapter 2 are accepted, there is the need to teach (and learn) with up-to-date ICT technology. There is currently very patchy provision across HE.

3.7.4 Of course the effectiveness of ICT is determined completely by academic staff time, enthusiasm, and capability at preparing material and delivering it.

3.7.5 There is a range of potential technology that can be used in seminar and lecture rooms: powerpoint/data projector as minimum, video projectors, network connections, sound systems, video conferencing. Costs vary from £3,000 to £100,000 per room depending on use, the facilities required, and size (seminar room, large lecture room). A university might have 50-100 rooms still without these types of facilities (precise figures vary considerably between institutions, these numbers were quoted by some case study institutions).

Examples

A university plan included capital spend requirements along the following lines. They have about 25% of open bookable teaching accommodation equipped with what they see as the 'standard' fit for purpose teaching equipment, including data projectors and network connections. Over the next five years they were aiming to achieve this level of 'fixed' provision across 50% of their teaching space – an additional 60 rooms including equipping one significant lecture theatre a year. A higher spend was outwith their capital budgets. (**Institution T**)

A head of Education (RAE 5*) is located in a recently refurbished building. However, even in this building the teaching rooms do not meet the minimum requirements. He is clear on what constitutes the ideal space – powerpoint, display boards, plug in by each seat. However, he does not believe that the lack of equipment is affecting the way people teach – it is the human factor.

In the same institution only one room (out of 130 at one campus site) has powerpoint, and they estimate the need at £395,000 (£3,500 per room) **(Institution A).**

In **Institution G** the Head of the Central AudioVisual Unit supports 62 common user lecture/seminar rooms (one-third of these seat over 100). The lecture theatres have a sound system, video and data viewing facilities, microphones, telephone help-line and there is some video conferencing. Most of these centrally booked rooms have been updated in the last five years. Departments own the majority of seminar rooms – probably another 80 – but these are increasingly being taken over for common usage as departments cannot afford the updating and maintenance of the rooms or their equipment.

A large research university (**Institution Q**) estimates that £1.5 million is required over three years to upgrade all or most centrally booked rooms (at around £10,000 per room on average) to a basic provision. 'Our regular budget would provide about £0.3 million of that, leaving a deficit of around £1.2 million. There might be as many departmental rooms again, with a similar cost of around £1.5 million to upgrade: we have no budget for this.'

Institution C has acknowledged the need to standardise audio-visual and teaching equipment in its rooms (e.g. whiteboards). This has not been addressed as the money was 'sucked into supporting Research build'.

3.7.6 The unmet need across the sector as a whole might be of order of £100 million (50 rooms in each of 170 institutions at a cost of £10,000 per room). However, prequisites for this level of spend must be:

- changing the paradigm of delivery – requiring training, development of materials, etc;
- right estate to put the technology in – with its use reviewed, situation and condition suitable, flexible in nature;
- emerging visions as to the possible shifts in methods and use of facilities that need to take place with new developments such as PDAs (network access by students in PC suites, seminar rooms, lecture rooms etc; technological and learning support structures to facilitate this).

Teaching laboratory equipment

3.7.7 In September 1997 a report by PREST for the Funding Councils and sector representative bodies[60] gave the findings of a comprehensive survey of teaching equipment. This was based on detailed case studies and a survey of HEIs in England and Wales. It focused on equipment above £500. It broadly followed the same methodology used to investigate research equipment (see the science report).

3.7.8 The main finding of this report was an estimate of the total value of equipment needs across England and Wales of £298 million for departments' top five priorities, based on the case studies and adjusting for full-time equivalents and the subject mix. To this may be added a further 25-35% for associated facilities, maintenance and service and extra staffing, giving a total in the range of £373-£402 million.

3.7.9 Of this, laboratory and engineering equipment accounted for 35% of priority items by value, computer hardware and software accounted for 38%, and audio-visual equipment for 19%.

3.7.10 This still broadly reflects the need today. There has of course been significant change since then, not the least from the funding provided by HEFCE for

[60] Survey of Teaching Equipment in Higher Education Institutions in England and Wales, PREST, for HEFCE, Higher Education Funding Council for Wales, CVCP and the Standing Conference of Principals, September 1997.

teaching and learning equipment. At the same time technological change has been immense, use of ICT has increased, equipment cost structures have changed. The PREST survey does not cover all equipment, did not include Scotland, and was expressed in 1997 prices.

3.7.11 In discussions with department heads, gaps were confirmed, but it was difficult to obtain good quality information on equipment gaps, as reported in the science report. However, from a small sample of institutions remedial backlogs were identified in equipment at a value of 12% of the total insurance value of £8 billion (see paragraphs 4.4.16 and 4.4.17 of the science report). Broadly half of this was allocated to science research. The other half could be attributed to teaching. This would lead to an estimate of £0.5 billion for teaching. This is at about the same level as identified by PREST (a similar consistency in figures was found in the science research totals).

3.7.12 Therefore the current gap is estimated at around £400 million. This can be exemplified by the following:

- the continuing gap in science research equipment affects teaching equipment – out-of-date or unneeded research equipment is transferred to teaching; in research-intensive institutions a substantial proportion of teaching is performed on research equipment;[61]
- significant gaps in some disciplines have been identified – e.g. in art and design (see our companion arts and humanities research infrastructure report) by the chair of the RAE panel;
- the QAA found that, in general, subject reports are positive about the efforts that institutions make to provide modern capital equipment for use by students, while recognising the limitations imposed by the expense incurred in some areas. For example, almost half the reports in chemical engineering refer to the need to upgrade pilot plant equipment and materials, and similar comments are found in materials technology;
- the QAA found generally positive statements about specialist facilities, however there were two related subjects where real concerns have been expressed by reviewers. In both Drama, Dance and Cinematics and Communication and Media Studies, significantly less than half of the providers were reported as having impressive facilities; there were many shortcomings, including out-of-date equipment and a lack of investment strategy.

3.7.13 This has been supported by department heads, e.g.:

> 'We need investment in traditional infrastructure, hand/eye coordination, visual literacy, as well as leading edge multimedia tools. Hardware is needed of £500,000 p.a. for 5 years and then start all over again, to be able to provide quality educational programmes and enable students to be career trained. We have a funding gap of £350,000 p.a. just on hardware... Lack of provision is driving development into other areas, teaching more theoretical courses such as fashion marketing which we can afford to do' (Dean of Art and Design, **Institution S**)
>
> '80% of humanities budgets relate to staff. After space charging there is

[61] PREST (see footnote 60) p8.

very little left for spending on equipment. We have nowhere near the equipment available at the peer comparator for our school' (School of Languages, **Institution R**). In the music department they no longer even think of what equipment they would like (e.g. minority instruments) they think in terms of 'how can they afford what they must replace'.

3.7.14 Institutions also gave (generally unquantified) evidence of need:

In **Institution J** they believe that industry focused disciplines need to use state of the art equipment to allow graduates to be created in the mould required for industry. They have been resourceful in acquiring equipment from market leaders: e.g. have £2 million of digital post imaging equipment acquired for £200,000 by virtue of a training arrangement with the manufacturer. They also support regular upgrades, but there is still a gap of £750,000 for the current upgrades required in one faculty alone. With the speed of technical obsolescence in media equipment and computer aided design in many subjects, there is an increasing demand for large expenditures on equipment. The same principles apply in other subjects, e.g. fashion.

In **Institution C** teaching is carried out with old research equipment 'students with 3As find that they are using equipment that is less cost than they have at home' (Head of Science) 'as students interface with the best of international science (5 and 5* departments) they find enormous disjunctive.'

In computer science **(Institution Z)** they would like two or three times the amount they have available on equipment each year. The current value of equipment is £750,000 and they really need a three year replacement cycle – £250,000 p.a. They have available £50,000 p.a.

In the fashion department in **Institution Z** they feel that if they are going to compete in providing the skills required, they need to spend £150,000 on software used by an industry leader (design to shopfloor). They currently get around this problem by having year 3 placements and having a term in a New York institution (where state of the art computer equipment and cutting machines are available).

Other departments in that institution argue that not all industries require graduates to be specifically 'trained' in equipment usage, and 'approach' is more important (which does not require such up to date kit). Deciding which industry, and therefore which course, falls into which category is key. For example, not all communications courses have the same mission – the approach would differ across the HE sector. However, what this predominately teaching institution does illustrate is that even in those areas where it is accepted that 'state of the art' equipment is not a requirement, the level of funding available does not cover even basic equipment requirements.

3.8 Requirements: advanced infrastructure

3.8.1 The two categories of remedial investment discussed above should enable all UK institutions to bring their infrastructure for teaching to a state where it poses no significant constraints on their ability to deliver their current teaching objectives, and has no further back-logs to be rectified. However, there is an additional need for some investment in infrastructure projects at a national level to enable the developments in teaching and learning which are required to keep UK institutions abreast of the latest and most effective methods, and to deliver the Government's agenda of widening participation.

3.8.2 Two aspects to this requirement: off-campus e-learning, and local facilities can be identified.

Distance e-learning

3.8.3 Most institutions offer distance e-learning; however, none does more than a small amount. The Open University has little of its course material electronically transferable, and it is significantly supported by face to face contact teaching. The University of Phoenix uses local facilities for much of its provision – and small classes. Distance learning is unlikely to be the solution for increased participation in the 18-30 year-olds due to the need for face to face contact (chapter 2) – 'low completion rates continue to reflect students' frustrations with those features of the virtual learning environment which do not match up to the on-campus experience'.[62]

3.8.4 However, it could play an important, and increasing role in lifelong learning, work-based learning/vocational provision, and for mature students (especially on postgraduate courses). This could be through learning at home (if TV/games console type of communications can be effectively used for learning, which would require a suitable environment, good quality screen resolution, good seating, two-way communication etc), at work (networking and hardware supplied by employers) or by students accessing networked PCs in local premises.

3.8.5 The University for Industry (UfI) provides one useful model of this – HE provision linked to existing infrastructure such as learndirect centres (a network of over 700 learning centres equipped with computers; with over 80% of its courses offered online). This provision is targeted at re-skilling British workers for the knowledge age.

3.8.6 There are several other models of distance e-learning, many still in development stages: the e-University, Universitas 21, the international publishing company Pearson plc's links with universities (to create a giant online venture); as well as individual university programmes (e.g. Cambridge University's e-MBA).[63] Like the University of Phoenix these are generally targeted at more self-reliant or mature students, or overseas students, but not at non-traditional students. Full implementation (and cost-recovery) generally looks some way off.

---

[62] Virtual Education (see footnote 17) p135.

[63] Virtual Education describes these, and other partnerships and initiatives (see above) p111 et al, p135.

3.8.7 There are some specific local examples, e.g. University of Glamorgan with European regeneration funding (although coupled in this example with local delivery).

Local facilities

3.8.8 Success in widening participation will include flexibility of provision. Local, HE-quality provision could be an important means of attracting students and of facilitating their learning. Although distance e-learning may contribute, provision would be predominately face to face (traditional or e-learning), and this would require local facilities which are HE in nature (not in FE, local libraries, schools, community centres).

3.8.9 There may therefore be a requirement for small local quality HE campuses in areas of particular importance for widening participation which are currently not served with HE facilities. This would require a significant investment, targeted in specific locations.

Requirement

3.8.10 There is no precise way to define the need here. It is not a formulaic generic requirement, but a more selective one to support a few 'beacon' initiatives which will address specific needs, and may also act as models for subsequent more general application in the sector. A fund of £100-£200 million would be appropriate to help pump-prime suitable initiatives in these two areas. Institutions would be able to bid for this, within the context of their strategies for widening participation, and for the infrastructure for teaching and learning.

3.9 In summary

3.9.1 The remedial investment need is:

- £4.6 billion for generic institutional infrastructure for teaching;
- £0.5 billion for the well-found teaching environment, made up of £0.1 billion for ICT in classrooms and £0.4 billion for other teaching equipment;
- a scheme of £100 million over a period of a few years for advanced projects to support widening participation and lifelong learning (local facilities, distance e-learning, work-based learning).

3.9.2 The benefits from this investment to the UK will include:

- a continuing quality of education, keeping in line with modern educational methods and techniques;
- the facilitation of widening participation, and achieving the Government's objectives;
- maintaining the international competitiveness of UK higher education;
- more efficient use of resources (fit for purpose, space utilisation, lower maintenance costs).

3.9.3 However, to be effective, the funding of these gaps must be linked to:

- estates and asset management strategies (which in turn are linked to teaching and learning, widening participation, and research strategies);
- an improvement in the status, professionalism, and involvement of the estates management function so that it becomes an integrated part of the strategic management of institutions with the necessary level of skills and seniority of staff to deliver this;
- a more strategic approach to strategies for teaching and learning and to the use of academic staff time, expertise and commitment. 'Operations must be re-engineered as well as space. And we are not near it.'

Appendix A

Terms of reference

The purpose of this study was to review the higher education infrastructure for teaching and learning and in particular:

- to review the adequacy of university and college infrastructure to support teaching;
- to define and measure the size of any investment gap in this infrastructure;
- to identify the factors which contribute to institutions' investment decisions in this area and their relative importance;
- to draw out any policy recommendations for the future.

Advisory groups

The study was overseen by an advisory group made up as follows

John Rushforth	Higher Education Funding Council for England
Tony Bruce	Universities UK
Sheila Watt	Head of Teaching Policy, HEFCE
Peter Milton	QAA
Patricia Ambrose	Executive Secretary, SCOP
Vic Slater	Association of University Directors of Estates
Paul Hubbard	HEFCE

The following individuals attended an expert group and/or commented on reports.

Professor Aldwyn Cooper	University of Glamorgan
Paul Coyle	London Guildhall University
Professor Claire Donovan	Southampton Institute
Suzanne Shale	University of Oxford
Margaret Herrington	Nottingham University
David Sweeney	Universities and Colleges Information Systems Association
Martin Price	Universities and Colleges Information Systems Association
Professor Graham Gibbs	The Open University
Professor Roy Leitch	Heriot-Watt University
Professor George Gordon	University of Strathclyde

Professor David Tidmarsh	University of Central England
Helen McNeill	University of Ulster
Professor Stuart Palmer	University of Warwick
Vanessa Young	Canterbury Christ Church University College
Toby Bainton	Society of College, National and University Libraries
Julie Swann	QAA
David Young	Universities UK
William Locke	Universities UK
Cliff Allan	Learning and Teaching Support Network
Dr David Halton	University of the West of England
Steve Phillips	Standing Conference of Principals

Organisations consulted

The following organisations were consulted:

Action on Access

Council of University Deans of Arts & Humanities

Consortium of University Research Libraries

JISC

Learning and Teaching Support Network Arts & Humanities Subject Centre directors

Society of College, National and University Libraries

Standing Conference of Principals estates directors

The Humanities Associations

The North West Universities Association – Learning and Teaching Strategies Group

Universities and Colleges Information Systems Association

Glossary

capital (spend)
expenditure which is capitalised in HEIs' published financial statements

cost adjustments

adjustments to institutions' published financial results as required by, and defined under, the Transparency Review. There are three adjustments – infrastructure; cost of capital employed (COCE); and exceptional items.

CVCP
Committee of Vice-Chancellors and Principals (now Universities UK)

Disability Discrimination Act

Disability Discrimination Act 1995, extended to HE in England through the Special Educational Needs and Disability Act 2001. Similar requirements exist in other countries.

DNER

Distributed National Electronic Resource – networked materials available for teaching and research, controlled by JISC.

EMS
Estates Management Statistics

e-University
a UK-wide project with the purpose of delivering higher education materials and courses through the internet (see chapter 2)

FE
further education

fitness for purpose
as defined for the EMS database, with condition classified into four categories: A, B, C and D. Condition C is buildings which are operational, but with major repair or replacement needed within three years; Condition D is buildings which are in an unacceptable or inoperable condition

full costs/full economic costs
the full economic costs of an activity or project. This is the total of direct costs and indirect costs, and the inclusion of economic charges for an appropriate share of infrastructure and capital

Funding Councils
HEFCE, SHEFC, Higher Education Funding Council for Wales and the Department for Employment and Learning, Northern Ireland

GII
Generic Institutional Infrastructure

HE
higher education

HEFCE
Higher Education Funding Council for England

HEIs
higher education institutions, comprising universities and colleges of higher education

HESA
Higher Education Statistics Agency

infrastructure
used in this report to mean the physical infrastructure of an institution – buildings, plant and associated mechanical and electrical services, equipment, IT, libraries and related information resources. The focus is on capital expenditure, but recurrent expenditure in terms of maintenance, library materials, IT and technical support staff and services is also considered

IT/ICT
information technology/information and communication technology; these terms are used interchangeably in this report

JANET
Joint Academic Network. The UK's education and research network, linking all FE and HE institutions, Research Council sites, and other bodies with a legitimate interest in working with the further and higher education and research community

JISC
Joint Information Systems Committee

LRCs
learning resource centres in HEIs: buildings encompassing libraries and other information services, including some PC provision

maintenance (spend)
expenditure on maintenance, as defined for the Financial Statistics Return (HESA) i.e. spend which is not capitalised in institutions' financial statements

non-publicly funded (NPF) activities
the non-publicly funded activities of HEIs comprising NPF research (UK charities, European and overseas governments, industrial and commercial sponsors); NPF teaching (student teaching not partly or wholly covered by a government grant – whether higher education, teacher training, further education, or nursing); and Other activities

Other activities
a term used to describe all primary activities in an institution other than Research or Teaching, as defined under the Transparency Review (it is not the same as Support, which is defined separately under Transparency)

PDA

personal digital assistant – a mobile computer/communication device

PF activities

publicly funded activities as defined under the Transparency Review. These include research funded by institutions, Research Councils, Funding Councils, UK government, and the European Commission; and all teaching which is funded (to some extent) by government (including HE, FE, teacher training, nursing)

QAA

Quality Assurance Agency for Higher Education

PREST

Policy Research in Engineering, Science & Technology

RAE

Research Assessment Exercise. A periodic assessment of the volume and quality of research, undertaken by the Funding Councils. Departments in each field (unit of assessment) in an institution are then awarded a rating on a five-point scale. Those with the highest ratings receive more funding. The results of the latest RAE were published in December 2001, although references to ratings in this report refer to the 1996 RAE

Research (R)

as defined under the Transparency Review – based on the Frascati definition of research

Research Councils

Engineering & Physical Sciences Research Council, Particle Physics and Astronomy Research Council, Biotechnology and Biological Sciences Research Council, Medical Research Council, Natural Environment Research Council and Economic & Social Research Council; also Arts and Humanities Research Board for the purposes of this report

SRIF

Science Research Infrastructure Fund

SuperJANET

an advanced broadband network linking a number of institutions and Research Councils at a higher bandwidth than JANET (see separate entry), aimed at enabling innovative use of network applications

Support activities

activities in support of Teaching, Research and Other activities, as defined under the Transparency Review

Teaching (T)

a term used to describe all teaching activity, as defined by the Transparency Review

teaching and learning

the definitions used in this report to describe teaching and learning are:

on-campus	main HE estate, with significantly face to face provision, but own study and e-learning too
local facilities	HE provision in own facilities (community venues, FE colleges, or HE-owned premises) not on main HE estate
off-campus	any learning (face to face or e-learning) not on main HE campus
distance-learning	provision off-campus which can encompass the use of physical HE premises, hard copy courses, or electronic courses (CD or web)
e-learning	all types of electronic aids to teaching and learning; used either on-campus or in distance learning
distance e-learning	courses delivered significantly by electronic means, generally over ICT networks
mixed mode	traditional classroom style delivery, mixed with e-learning; (also known as blended learning)

Transparency Review

as part of the sector's accountability to Government, and to enhance internal costing information, every institution is reporting annually to Government the costs of Teaching (T), Research (R) and Other (O). T and R are categorised into publicly funded activities (PF) and non-publicly funded activities (NPF). The information is being prepared in a robust way according to a detailed methodology established by the Joint Costing and Pricing Steering Group (JCPSG July 2000: Transparent Approach to Costing). This required all academics to complete time allocation schedules; for indirect cost rates to be established on a consistent and auditable basis; and for the reported costs to include 'cost adjustments' relating to cost of capital employed (COCE) and an infrastructure adjustment

universities

the term universities in this report is deemed to cover both universities and colleges of higher education

Universities UK

Umbrella organisation representing the views of vice-chancellors in the UK, previously CVCP. The term Universities UK in this report is generally deemed to cover both Universities UK and the Standing Conference of Principals of Colleges of Higher Education

widening participation

increasing access to learning and providing opportunities for success to a much wider cross-section of the population than now

Higher Education Funding Council for England
Northavon House
Coldharbour Lane
BRISTOL
BS16 1QD

tel 0117 931 7317
fax 0117 931 7203
www.hefce.ac.uk